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AVIATION

The Oldest American Aeronautical Magazine

LIGHT PENETRATION THROUGH *Fog*

PRESENT DAY *Lighting Facilities*

THE *Boeing 80-A*

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AVIATION

The Oldest American Aeronautical Magazine

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Contents for May 10, 1930

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COMING

¶Operating Methods in the Antarctic by Sir Hubert Wilkins ¶Creative Wing Design ¶Coming descriptions—the Curtiss Condor, Savoia-Marchetti amphibion

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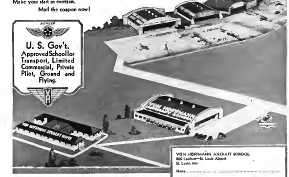

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AVIATION

THE OLDEST AMERICAN AERONAUTICAL MAGAZINE

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EDWARD P. WARNER, *Editor*

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Compromises

REVIEWING in retrospect the aviation ensemble as presented at Detroit, a shift in controlling forces is manifest Chronologically, the very earliest expressions of aviation development were primarily affected by the pilot—his judgment the alpha and omega of design influence Then the engineer came into ascendency, and aerodynamics and stress analysis rode at the control stick of aircraft development Then the invasion of the financier, and with him his ever-present ally the production man, and the motivating force of aircraft manufacturing progress lay in their methods and policies.

As each in turn handled the controls of airplane development, they left a definite impress of their several influences, and during their successive phases, their various specialized attitudes were predominant in the development of their respective periods Now, for the first time, a truly composite picture is beginning to emerge No longer is the airplane an expression of one predominant force of the moment It is beginning to become a compromise expression of all forces, including the introduction of a hitherto inarticulate power—the desires of the passenger and of the private owner.

Compromise is beginning to come into its own, as it inevitably must if the industry is to attain its business "ceiling." The pilot must sacrifice some of his ideas of maneuverability and speed to the greatest comfort and convenience of the passengers; the engineer must sacrifice some of his best theory to practical considerations of ease of manufacture and cost; the production man must not only make the parts at the minimum of cost and maximum of dependability, but he must also be ready to offer suggestions of process redesign that will save material and costs; and the financier must modulate his desires for immediate profits to permit the financing of basic research and fundamental technical development.

For this new predominating influence of co-operation the industry is to a great extent indebted to the men and women outside the industry who are the ultimate users of its products. They more than any other influence have been responsible for the birth of this new age of compromise They never hesitate to make their feelings known Their criticisms and reactions as they view the planes at an air show or airport may seem naïve to the aeronautical specialist, but rightfully interpreted they are the foundation stones of successful aircraft development.

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Pilots and Pink Beans

SINCE the safety of airline operations depends more directly upon the pilot than any other one factor, everyone agrees that the pilot should be in perfect condition while flying, and that he should be given every assistance in keeping that way

All responsible aircraft operators take every precaution when selecting pilots to obtain capable and experienced men of proven judgment and reliability. Once selected, they are subjected to semi-annual physical tests as required by the Department of Commerce, Aeronautics Branch Often they are tested each month by company physicians There is no other direct check upon their physical condition In their work they are given such executive supervision as normal operating procedure readily permits, but it is unfortunately true that companies sometimes find they have made a mistake in hiring a pilot only after he has made a serious, perhaps a fatal, blunder.

Under the same conditions, he might not have made the blunder the day before He might not repeat it tomorrow Transport pilots are subject to all of the troubles which beset other individuals Pilots may be taken sick, may be sick and perhaps not realize how seriously, may be suffering mental depression due to family troubles or financial worries, may have been up

all night with a sick baby, may even be recovering from the effects of a spree at the time when they report for active duty. Even the most reliable men deviate from normal condition occasionally, and may rate themselves ready for duty when the effects of such temporary conditions have left them temporarily below par. Although mental, physical, and nervous conditions may all be checked against an individual's normal rating, appropriate tests being quite within the normal routine of industrial trial psychology, there is at the present time no company which makes an official check of personal condition just before each duty period and the pilots themselves rarely know from day to day just how their condition may check with normal. Men who can judge themselves fairly are scarce, especially when pride stands in the way of admitting that they do not feel up to their job.

The measurement of such simple quantities as the number of pink beans that a man can pick up one at a time and place in a container within a specified period, the number of times in a given period that he can poke a needle through a hole in a metal plate, the speed with which he can draw straight lines between dots on a sheet of paper, and other kindred tests, if checked against standard normal performances, would make it possible to keep closer tab upon the day-to-day fitness of the flying personnel. Such devices have the merit of requiring no high order of specialized professional skill for their application, but a draft must be made upon the accumulated wisdom of the experimental psychologists to tell us what kind of apparatus to use and where to begin on behalf of the industry, we cordially invite their attention to our pilot maintenance problem.

Here is a definite step which can be taken to add to our margin of safety in aircraft operation. If juggling beans can add to safety, let's put the beans to work.

"To See Oursel's as Ithers See Us"

MUCH has been said concerning the necessity of "dressing up" aviation for the public, but results show themselves but slowly. Even though the air lines must pare down expenses in an effort to bring operating costs more nearly into balance with current revenue, there is no excuse for some of the things that are allowed to take place.

One Sunday a few weeks ago, a group of passengers leaving Chicago were forced to wait half an hour after the scheduled time of departure before a plane was ready for them. They waited, while the tri-motored craft in which they were supposed to depart stood in front of the passenger station not a hundred feet away and mechanics worked steadily on one of the wing engines. For some reason, the engine would not "turn up." Each time that the throttle was advanced, the engine backfired and spit. The mechanics even changed earbureters, but to no avail.

There was a large crowd at the airport as is usual on a Sunday, and every time that the engine backfired the crowd became visibly more alarmed. Some of the spectators remarked that it was a crime to allow passengrrs to fly in a plane like that. Their friends nodded their heads sagely. The air line officials of course had no intention of attempting to take-off until the engine could be made to function properly. But how should the public know?

When it became apparent that the trouble was not to be eradicated, another plane was brought out and warmed up and the passengers prepared to embark. The engines of the second plane operated perfectly, yet many of the passengers, knowing little or nothing of aviation, climbed into the cabin with obvious trepidation. It would be interesting to know how many of them would have cancelled their passages if graceful opportunity had presented itself. Momentary expectation of engine failure was unquestionably in their minds, as well as in those of the spectators on the ground. Had they not seen the type of equipment that the line was attempting to operate?

It may be that the personnel was cut to the bone. It may be that it was a physical impossibility for the mechanics to get the first plane in readiness before the scheduled time for its departure. Neither of those things was a sufficient excuse for effecting repairs in front of a holiday crowd of spectators, all of whom had the right to be regarded as potential passengers.

The officials of many leading companies have learned, a long time since, that it is a mistake to make even minor adjustments on a plane in view of the public. The planes are warmed up and inspected in hangars well removed from the passenger station. If any repairs and adjustments are necessary, they are made inside the hanger. It is only when a plane is ready in every respect that it is brought out before the public gaze.

The reason for this, the officials who have learned the lesson will tell you, is that the backfire of an engine will clear the station of passengers more quickly than would a cry of "Fire." Other air line operators, who have not adopted such stringent rules for the concealment of tinkering, will do well to meditate on that statement.

"Blind" or "Instrument" Flying?

MODERN MINDS attach much greater importance to nomenclature than did Shakespeare, and feel that the query "What's in a name?" is not to be lightly answered. The Boeing Company, for example, insists that "blind" flying is a misnomer when applied to flying by instruments, and have abandoned the use of the term. If a pilot feels the helplessness that the idea of blindness conveys to the person of normal vision, they say, he had better descend forthwith. "Instrument" flying is, however, receiving an increasing amount of attention, students in the schools being trained to fly in hooded cockpits for long distances and over triangular or other irregular courses. The same practice has of course been extensively adopted elsewhere, especially by transport lines seeking to put a super-finish on the qualifications of their own personnel.

Pilots who have not been trained to depend on instruments are prone to become panicky after a few minutes without seeing their course. Those with only a limited experience find the nervous strain of long-continued instrument flying terrific. There are well trained and reliable pilots of the older generation who still insist that no one can fly solely by instruments for more than five or ten minutes without losing his nerve. Yet young students are learning to fly prolonged and irregular courses entirely by instruments in hooded cockpits, and navigating with remarkable accuracy.

Colonel Lindbergh is reported to have said that one of the hardest things about his New York to Paris flight was to believe that the instruments were right when his personal feeling was that they must be wrong. Other pilots innumerable have told the same story. Navigators of long flight tell of the tendency of even the most experienced pilots of the older school to seek visibility, even at dangerously low altitudes, rather than fly through fog or clouds for even a few minutes. And there is little doubt that some of the regrettable transport accidents might have been avoided had the pilots of the planes been thoroughly trained in flying by instrumental guidance alone.

Dependence on instruments, however, places an ever-increasing responsibility on both the instrument manufacturers and on those who select the equipment. On the former to design and build instruments of the greatest accuracy and reliability. On the latter to select the best instruments obtainable. Only reliable products by makers with a reputation to sustain should be considered, and if the price is somewhat higher than for some alternative product it is a cheap form of insurance. Safety is at stake in the development and use of the most efficient, most reliable, and sturdiest aerial navigating equipment available.

Motor Gliders

THE AIRPLANE began as a glider. The Wrights were first interested in aviation through the gliding experiments of Lilienthal. With the glider they initiated their own work. Octave Chanute and A. M. Herring in America, Ernest Archdeacon and the Voisins in France, others there and elsewhere inaugurated their aerial activities with motorless craft. Now after twenty-six years of powered flying we have gone full circle. The glider is again a focal point of our interest.

As an instrument of sport, the glider has much to commend it. As a finishing touch upon the training of pilots, it serves a useful purpose. As a vehicle of research upon aerodynamics, upon control and stability and especially upon the structure of the atmosphere, it is, as German experience has proved, of immense value, but let it be emphasized that in all those capacities it functions as a glider. When a power plant is added it becomes something else.

The term "motor glider" is flatly self-contradictory. A glider is, by definition, an aircraft without a motor. The German phrase "glider with motor assistance" is more logical, but even more dangrrously misleading in its implication. It suggests the idea of an outboard engine applied as an afterthought, an idea which recent motor-boating experience makes American opinion all too ready to grasp.

A certain number of true gliders have been equipped with auxiliary engines for certain definite purposes, especially for taking soaring machines to a substantial altitude to start experiments on the vertical motions of the air at those levels. They have not been easy to fly and, judged by their very limited use in Germany where they originated and by their rather bad record of accident, they have not been particularly safe. A certain number of machines, too, have been developed with the glider as a background, the Klemm being the best known example with a long record, but they stand on quite a different footing. There has been nothing to suggest that a glider with an engine added as an auxiliary is in any sense a satisfactory airplane.

The fundamental conditions are different. In a glider, weight is of very secondary importance. If structural weight be increased, it can be provided for by further increase in the span. Minimum speed of gliding descent is the sole aerodynamic objective. In an airplane which is to fly with low power, low gross weight is virtually as important as lift/drag ratio.

For the light, low-powered airplane there is certainly a place, but it should stand on its own feet, or rise on its own wings, not on an arbitrary extrapolation of the glider's attractions. Some of the most successful of really light planes, like the De Havilland 53 of six years ago, have been quite independent of any glider ancestry. The light plane follows essentially the same rules of design as the F-32 or the Patrician.

Soaring flight desecves all the encouragement that the American aircraft industry and aeronautical scientists can give it. So does the airplane of low power, light loading, and low cost. But the idea that they can be merged, except for use with great discretion and in the hands of an expert, is to be shunned, at least until we are presented with some technical innovation not at the moment visible.

THE PENETRATION OF *Light* THROUGH *Fog*

By Dr. S. H. Anderson

One of the most important problems confronting aeronautics is the project of fog penetrating lights. Dr. S. H. Anderson has for some time been carrying on research work at Wright Field, Dayton, Ohio, under the auspices of The Daniel Guggenheim Fund for the Promotion of Aeronautics and the Materiel Division of the United States Army Air Corps. The following preliminary report by Dr. Anderson gives some interesting details of the progress of this work, which will not be completed until June or July, 1930, at which time a complete report will be issued.

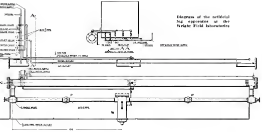


Diagram of the artificial fog apparatus at the Wright Field laboratories

THE INVESTIGATION was initiated by the Experimental Engineering Section, Materiel Division, at Wright Field, as a part of the general program for developing aids to fog-flying and fog-landing. A great service would be rendered to aerial transportation, both commercial and military, were some kind of light radiation found that would penetrate fog more effectively than any now in use.

Light is the physical stimulus of the sense of sight. In flying this sense is the most valuable of all. By sighting on the ground, the horizon, sun or stars the pilot maintains the correct flying position of the ship. By sight, he identifies distinguishing landmarks, picks out the airdrome, judges the altitude of levelling off for landing and the instant for setting down the airplane.

In fog, reduced visibility makes the pilot's eyes practically valueless for any of these functions. This is the great hazard of fog.

A recent report from the N.A.C.A. Laboratory, Langley Field, emphasizes the importance of sighting on some reference point while flying. Observations were made of the flight paths of eleven different pilots flying blindfolded. In every one of twenty-five trials the airplane was eventually put into a turn which generally assumed a decreasing radius terminating in a diving spiral. These tests seem to disprove the opinion held by many pilots that "flying" sense is one of muscular balance. Furthermore, these show definitely the necessity for a reference of some kind. ("Spiral Tendency in Blind Flying," N.A.C.A., Technical Note No. 314, August, 1929.)

The recent experiments of Lieut. James Doolittle have demonstrated the possibility of flying blind by the use of instruments. However, it is the experience of those who have tried this, that the pilot undergoes a tremendous nervous strain. This strain is relieved and confidence restored when he can see some land mark for orienting himself and judging his altitude. A distinguishing light offers the greatest hope for such a purpose and may prove a most valuable supplement to the use of instruments.

At the time this work was started no authoritative information was available on the transmission of light through fog. Recently two papers have been published, one from the Naval Research Laboratory ("Absorption of Light by Fog," by L. P. Granath and E. O. Hulbert, Phy. Rev. pp. 140-144, vol. 34, July, 1929) and the other from the Bureau of Standards ("Relative Visibility of Luminous Flashes from Neon Lamps and from Incandescent Lamps With and Without Red Filters," F. C. Breckenridge and J. E. Nolan, Research Paper No. 78.) The observations, which are the basis of these papers, were made in natural fogs. Their findings will be discussed at the close of this report and compared with the result of this investigation in artificial fog.

IT WAS thought that a laboratory study of transmission of light through fog would yield more definite results in a given length of time than field tests in natural fogs. The time required for the development of methods for producing fogs would probably be much less than the time lost in waiting on the vagaries of nature. The first problem, then, in this project was the development of methods of producing fogs in the laboratory, such fogs to stimulate natural fogs and at the same time be subject to control. Fogs of various densities would have to be obtained and fogs of given densities maintained long enough to render possible the making of observations.

A consideration of the conditions prevailing in the formation of natural fogs proved a valuable guide in designing artificial fog equipment. In an admirable paper by Dr. H. C. Willett ("Fog, Haze, Their Courses, Distribution and Forecasting." Monthly Weather Review, vol. 56, No. 11, a report prepared for the Daniel Guggenheim Fund for the Promotion of Aeronautics) fogs are classified under three heads: (1) Radiation fogs, (2) Advection fogs, and (3) Maritime fogs.

The first type occurs generally at night, inland, along river bottoms, in valleys, in cities and around industrial centers. The conditions for the formation of this type of fogs are:

(1) A relatively high humidity of the air just previous to the occurrence of the fog, caused by daytime evaporation of water into the atmosphere.

(2) A cooling of the lower layers of the air at night by radiation and by contact with the ground, cooled by radiation after sun down. This results in a shallow *temperature inversion*.

(3) A fairly quiet condition of the atmosphere. Fog

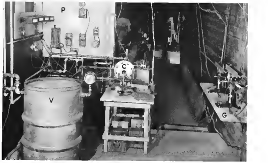


Fig. 2: Equipment for producing fogs in the laboratory. C is the fog chamber proper, P, a control panel, V, vacuum tank, and G, the galvanometer scales

does not generally form with the wind greater than 5 m p.h. On the other hand, if the air is extremely calm precipitation is in the form of dew. A *slight turbulence* is necessary to bring a large volume of air in contact with the ground slowly enough to permit cooling and rapidly enough to prevent complete precipitation to the ground

The second type, *advection* fogs, occurs when a warm, humid body of air drifts over a cold surface or more rarely, comes in contact with a cold body of air. Such fogs occur off Newfoundland and the New England Coast where the air from over the Gulf Stream drifts over the Labrador Current, and along the Pacific Coast where the warm humid air from off the ocean drifts over the cold water which wells up off the coast.

The third type, Maritime fogs, results from conditions which are a combination of those for the formation of the first or second type. Maritime fogs are prevalent over Continental Europe but rare in North America.

The formation of fog is also dependent upon condensation nuclei. The pioneer work of C T R Wilson (Phil Trans of Roy Soc of London, A, 1897, vol 189 p. 265, vol 192, p 403) showed that humid pure air may have a vapor pressure *eight* times that of saturated vapor pressure before condensation occurs. When electric ions smoke, dust and hygroscopic particles are present, condensation begins at a much lower degree of saturation. The particular degree of supersaturation necessary depends upon the type of condensation nuclei. In his article Willett points out that recent observational data indicate that condensation in fogs and clouds takes place under conditions of relatively low supersaturation, much lower than formerly assumed. The most effective nuclei of condensation are hygroscopic particles, such as magnesium chloride ($MgCl_2$) and sulphuric anhydride (SO_3). On particles of these materials condensation occurs when saturation is only slightly above 100 per cent. The nuclei of fogs occurring along sea coasts are almost exclusively $MgCl_2$. It is well known that radiation fogs are more dense around cities and industrial centers than in the open country. This is due to great numbers of hygroscopic nuclei poured into the atmosphere in the products of combustion.

The black fog or haze which frequently obscures certain localities (such as the Chicago Airport) is a type of radiation fog in which there is an unusually large number of condensation nuclei. The fog particles are consequently numerous and small and mixed with smoke and dust particles on which little, or no water is condensed. The fogs formed in the open country have larger particles. Since here there are fewer condensation nuclei present in the air, each nucleus has available a greater volume of humid air from which to condense water than is possible in a locality where the condensation nuclei are numerous. Both the small particle "black" fogs and the large particle "white" fogs are a menace to aviation and must be considered in the experiments with artificial fogs.

The fog chamber as finally developed and used in tests described in a later section is shown in Fig. 1. CC is a piece of standard steel steam pipe 6 in in diameter and 20 ft. long. It is closed at each end by a piece of plate glass. (For most of the tests pyrex glass was used, as this has a very uniform high transmission from 0.3 microns in the ultra-violet to 2.7 microns in the infra-red.) The pipe is lined on the inside with a helical coil of ½-in. copper tubing. Through this coil hot or cold water can be circulated and by this means the temperature of the air in the pipe quickly changed. There are connections to an air pressure line and a vacuum tank, by which the pressure can be increased or decreased. From a water tank, W, at 3-in. pipe, PP, runs to each end of the fog chamber. The water in the tank, W, is heated by an electric heating unit. The warm humid air and steam above the water may be circulated through the pipe or fog chamber by a small electric fan hung on the inside of the cover of the water tank.

Another electric fan, still smaller, is located inside the fog chamber at one end. When this latter is running, a turbulence in the air in the pipe is produced similar to that in a natural fog. Valves, VV, at each end of the 3-in. circulating pipe may be closed, thus shutting off the fog chamber from the water tank. The temperature of the air within pipe is indicated by three thermocouples, one at either end and one at the middle. A fourth thermocouple, soldered to the outside of the outside wall of the fog chamber, gives the temperature of the walls. A fifth thermocouple in the water tank indicates the temperature of the water.

Special precautions were taken to screen the light receiving instruments from light reflected by the inside walls of the fog chamber. In the first place the reflecting power of the inside walls was made very low. After the equipment was assembled, the interior was sprayed with optical black lacquer. While this was still sticky, soot from burning camphor gum was deposited on it. This produced a mat black surface of very small coefficient of reflection. In the second place, baffle rings were built into the temperature control unit, and so located as to cut off any light reflected from the walls.

Condensation nuclei were introduced into the fog chamber by a smoke injector, S. Tobacco was burned in this injector. In the later tests magnesium chloride was mixed with the tobacco. Particles of magnesium chloride are very effective as condensation nuclei. Fogs produced with its aid are of much longer duration.

At the middle section of the fog chamber are three glass windows 1 in in diameter. Two of these are at opposite ends of a diameter and the third at an angle of 30 deg. to the line of the other two. A beam of light from a

Table I

Color	Wave Length Limits	Filter	Light Detector
Infra-red	1 85μ to 2 7μ	Corning H T + Med Blue Green	Thermo-element
Deep red (near infra red)	0 70μ to 1 2μ	Wratten 88 A	Photoelectric cell UX 868 No 3
Red	0 60μ to 0 80μ	Corning H R Signal Red 155 per cent	Photo-electric cell UX 868 No 1
Yellow-Green	0 55μ to 0 65μ	Corning H R. Yellow Orange Shade + Corning Pale Blue Green	Photo-electric cell UX 868 No 1
Green	0 49μ to 0 61μ	Wratten No 61	Photo-electric cell UX 868 No 1
Blue	0 40μ to 0 51μ	Corning H R Lantern Blue	Photo-electric cell UX 868 No 1

small projector may be directed through the two windows opposite each other. Through the third window a microscope of low magnifying power is directed on the fog particles illuminated by the light beam. Thus it is possible to make a qualitative observation on the number and size of the fog particles. Exact measurements of the size of these fog particles are not possible because of their rapid movement.

Fig. 2 is a photograph of the assembled equipment. C is the fog chamber proper, P, a control panel on which are located gauges for measuring pressure and temperature, switches for controlling the electric circuits, and valves for control of air pressure and the circulating water. V is a vacuum tank. On the wall shelf, G, are the galvanometer scales. The galvanometers are on brackets fastened to the wall directly above the shelf. On the same at the observing end of the fog chamber are placed the photo-electric cells and thermo element for measuring the light intensities.

Three methods were used for production of fog. Two of these were based on the principles underlying the formation of radiation fogs. The other was based on advection fogs. The first step in each of the three methods was to circulate warm moist air from the hot water tank through the fog chamber. Condensation on the walls showed the air was saturated. Then the temperature of the air was made one or two degrees higher than that of the pipe walls, thus insuring a high humidity.

In the formation of small particle fog, a large number of condensation nuclei from burning tobacco were introduced. The smoke atomizer was operated until the testing light of 70,000 beam candle power was almost obscured. The air pressure was then increased to about 1.25 atmospheres. This was for the purpose of increasing the air temperature and the amount of water vapor. To produce a uniform distribution of smoke particles the air was circulated for a few seconds. By this time the light was completely obscured. In observing the particles through the microscope at the side window, an increase in size was easily distinguished. This growth caused the increase in fog density after the introduction of smoke. The duration of this type of fog was about an hour during which time measurements on the transmission of various colors were made.

To produce large particle fog, magnesium chloride was mixed with the tobacco. Just enough smoke was introduced to give the light a distinct red color. The air pressure was increased to 1.15 atmospheres. The valves VV between the water tank and the fog chamber were closed. The small fan in the fog chamber was started. This was kept in motion throughout the duration of the fog. In about two minutes, the air was suddenly expanded to normal pressure. An adiabatic cooling and a supersaturation followed. The result was an accelerated condensation. At first the fog was very dense, absorbing completely the visible light and a very high percentage of the infra-red. The fog was also rather unstable at first. In two or three minutes it reached a fairly steady condition and thinned out very slowly. Such a fog lasted between two and three hours. The large particle fogs were very much alike. In three series of observations, the average difference between readings were less than 10 per cent.

The particles in the second type are larger because the condensation nuclei are (1) less numerous, making possible more moisture per particle; (2) more hygroscopic due to the $MgCl_2$, (3) the air through expansion is supersaturated, insuring greater condensation. In the formation of both types of fog, condensation nuclei were introduced into a saturated atmosphere. In radiation fogs of nature the nuclei are present in the air before atmospheric changes occur producing saturation or near saturation. The artificial production of fog resembles the natural in that condensation nuclei are brought into contact with air of high moisture content. In the formation of natural fogs, nuclei are present *before* a high humidity is brought about, in artificial fogs, the nuclei are introduced into an atmosphere *already* saturated.

Table II—Small Particle Fog

Color	Per Cent Transmission Through 30 Ft of Fog	Coefficient of Absorption	Distance in Fog to Reduce Illumination to 0 1 per cent
Deep Red	[illegible]	0693	100 ft.
Inf Red	73	0157	390 ft.
Red	21	0780	89 ft.
Yellow	17 5	0870	79 ft
Green	14 5	0965	72 ft
Blue	14 3	0972	71 ft
Deep Red	50	0547	199 ft
Inf Red	85 5	0078	845 ft
Red	44	041	168 ft.
Yellow	39 5	0464	149 ft
Green	33	0554	127 ft
Blue	34	0539	126 ft
Deep Red	[illegible]	0144	480 ft
Inf-Red.	94	00305	2268 ft.
Red	67	0200	345 ft
Yellow	62	0239	289 ft
Green	35 5	0299	231 ft
Blue	39	0264	262 ft.
Deep Red	[illegible]	0693	100 ft.
Inf Red	63	0231	298 ft
Red	17 4	0875	79 ft
Yellow	15 0	0928	74 ft
Green	16 1	0913	76 ft
Blue	17 0	085	81 ft
Deep Red	43	0347	199 ft.
Inf Red	78	0124	555 ft
Red	48	0460	150 ft
Yellow	38	0484	142 ft
Green	38 9	0472	146 ft.
Blue	39 7	0461	149 ft.
Deep Red	[illegible]	0144	480 ft
Inf Red	89	0058	1193 ft.
Red	61	0247	279 ft.
Yellow	59 4	0280	264 ft.
Green	60 7	025	276 ft.
Blue	62 7	0233	396 ft.

Production of fog by an advection method was tried. As in the case of other types, condensation nuclei must be present. Warm moist air from the water tank was circulated through the fog chamber, thus bringing a body of humid air of high temperature into a region of lower temperature. At first a fog of large particles was formed. However, it did not last. By continuous circulation the fog particles were caught on the walls of the pipe, soon clearing the air of nuclei. Consequently this method was not used for any of the measurements of light transmission.

The source of light was a 200-watt 6-volt Mazda C incandescent lamp bulb, type G-30, filament type C-8. This was operated at 5.5 volts, 26 amperes, the voltage being low enough to insure constancy in the characteristics of the lamp The temperature, as measured with an optical pyrometer, was 2,700 deg K The filament of the lamp was very concentrated and well adapted for producing a narrow beam By means of a carefully selected system of condensing lenses a nearly parallel beam of light was projected through the fog chamber The illumination produced at the observing end was 170 ft -candles, corresponding to a beam candle power of 70,000

The intensity of the light emerging from the fog chamber was measured by photo-electric cells for the visible range and also for the near infra-red The infra-red radiation of longer wave-lengths was measured by a thermo-electric element Each photo electric cell was connected to a galvanometer which indicated the magnitude of the photo-electric current Likewise, the thermo-electric element was connected to a galvanometer The current through this was proportioned to infra-red

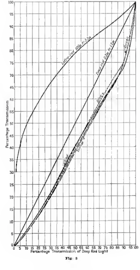


Fig. 3

radiation falling on the thermo-element Using shunts with the galvanometers made possible a range of current measurement of 1 to 1,500 This simply means that it is possible to detect and measure light flux coming through a fog reduced by the fog to 1/1,500 of the original magnitude

To select the photo-electric cells best adapted to this work the following tests were made:

(1) Determination of the relation of the photo-electric current to the light flux incident upon the cell

(2) Determination of the relation of the photo-electric current to the color (or wave length) of radiation of equal intensities incident upon the cell.

The tests showed that a voltage not too high, applied to the cell made the photo-electric current proportional to the light flux This is in accordance with the results published by Koller (Koller J O S A and R S I 19, 135, Sept, 1929) (General Electric Research Laboratory) subsequent to the completion of this work

To determine the effect of color on the photo electric current, spectral sensitivity curves were taken for five distinct types of cells out of a total of thirteen cells These covered a range from 0 25 microns to 1 2 microns (Ultra-violet light has wave lengths shorter than 0 4 microns visible light extends from 0.4 microns to 0 7 microns, and infra-red radiations have wave-lengths longer than 0.7 microns) A discovery was made concerning photo electric cells which was disconcerting at first but later was put to good use viz, that individual cells of the *same* type differ as greatly from each other as cells of different types Advantage was taken of this great unlikeness among the ranges of spectral sensitivity to adjust combinations of color filters and cells for the purpose of isolating relatively narrow bands of color

The photo-electric cells were of the cassium oxide type Cell No 3 had an unusual sensitivity in the near infra-red, extending to 1 2μ The cut-off of cell No 1 was at 0 8μ This was used to establish the long wave length limit of the red band 0.60μ to 0 80μ The thermo-element was a Kipp single element vacuum type It proved more rapid in its responses and held its zero more consistently than multiple junction types of thermopiles

By means of a suitable system of prisms and lenses it was possible to direct the light emerging from the fog chamber upon three photo-electric cells *simultaneously* or upon two photo electric cells and a thermo-element *simultaneously* This means made possible simultaneous observations of the effects of fog on three bands of color

Two bands of radiation in the infra-red and four in the visible part of the spectrum were used Considerable study of filters preceded the selection of these color bands The bands were so chosen that very little overlapping occurred or, in other words the color bands used represented distinct and separate regions of radiation

One band, deep red or near infra-red, was used as a standard for the comparison of other colors The bands of colors used the wave-length limits and the light detecting instruments are given in Table I

As previously pointed out, the photo-electric current was proportional to the light flux on the cell. Hence in order to find the percentage transmission of a certain color of light through the fog, it was only necessary to find the ratio between the photo-electric current with fog and the photo-electric current with no fog.

In taking a series of readings two observers were used,

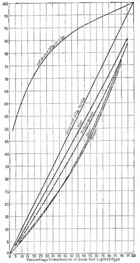


Fig 4

one for each galvanometer Readings were taken simultaneously for the deep red, infra-red and red Then the filter in front of one cell was changed and readings were taken this time for the deep red and yellow then the deep red and green and finally the deep red and blue This made possible the use of the deep red transmission as reference standard for the transmission of other colors

The beginning of a series of readings was characterized by a complete absorption of the visible colors, however, *considerable infra-red was always manifested*

As the fog cleared, the galvanometers measuring the transmission of the deep-red and other colors showed deflections These deflections slowly increased, indicating increasing transmissions of the respective colors Accurate readings were made possible by the slowness of the changes in the fogs

The transmissions for each color were plotted against the transmission of the deep red, giving a graphical representation of the relative transmissions for any one density of fog, also illustrating the respective progressive changes in transmission during changes in the density of fog

Fig 4 gives the graphs for the first type of fog ("small particle fog") These were plotted from the averages taken from four sets of readings Fig 3 shows the graphs for the second type of fog ("large particle fog") plotted from the averages of three sets of readings

The results of these observations are also shown in Table II The data from this table was obtained from Figures 3 and 4 by use of the equation

$$I = I_o e^{-kx}$$

in which

I_o = intensity of light flux at the source
I = intensity of light flux at the observing end
k = coefficient of absorption
x = distance (length of fog chamber)
e = 2 3026

This is a well known equation for the attenuation of radiation through an absorbing medium For purposes of computation, it is more convenient to put this in the form

$$\frac{I}{I_o} = e^{-kx}$$

In this latter form the ratio $\frac{I}{I_o}$ is the transmission, the values of which can be read from the curves

The curves show that in the "small particle fog" some variation in transmission for the different colors, the deep red light penetrating the fog the most, while the green and the blue penetrated the least The difference is more pronounced for the lighter fogs In the "large particle fog" there is very little difference in the transmission of different colors for visible light

For the dense fogs red proved to be the best, and for thinner fogs blue Yellow was the poorest for all densities of fog However the greatest difference between the red and yellow in transmission was only 4 per cent and the greatest difference between the blue and yellow was but 5 per cent It is important to notice the very marked increase in transmission as the longer wave lengths of infra-red radiation were reached For example, when the fog was so dense that only 2 per cent of the visible colors was transmitted, the transmission of the deep red (0 7μ to 1.2μ) was 4 per cent, while the transmission of the infra-red band, 1 05μ to 2 7μ was 40 per cent For all densities of fog the penetrating ability of this infra-red band was much greater than that of any other band measured, but its penetration was relatively much greater in the densest fogs and greater for the small particle fog than for the large particle

Table II gives some values for the coefficients of absorption and the distances required to reduce the intensity of the light to 1/1,000 (0 1 per cent) of its magnitude at the source. These distances give some idea of the densities of the fogs used compared with natural fog For illustration, take a small particle fog which reduces the intensity of the deep red light to 75 per cent of its initial value in the 20-ft fog chamber A distance of 480 ft of the same fog would reduce this color to 0 1 per cent; 345 ft would reduce the lighter red to 0 1 per cent 289 ft the yellow; 231 ft the green, and 262 ft the blue *For the infra-red (1 05μ to 2 7μ) it would require 2,260 ft of fog to reduce the radiation to 0 1 per cent*

The data in Table II agree in general with the results

obtained by Granath and Hulbert (Physical Review 34, 140-144, July, 1929) of the Naval Research Laboratory in their measurements on natural fogs. They found that the distance necessary to reduce red light of wave-length 0.65μ to 0.1 per cent of its initial intensity was 1.4 km (4,593 ft.), and for blue light of wave-length 0.45μ, 1.2 km. (3,937 ft.). The ratio 1.4/1.2 equals 1.17. Using the same colors, the ratio of the distances given in Table II for a light small particle fog is

$$\frac{345}{262} = 1.32$$

The measurements in the fog chamber show that for fog penetration red light is better than blue, and that the superiority of the red is greater than the work of Granath and Hulbert indicates. However, the natural fogs through which these observers made their measurements were relatively much thinner than those used in the fog chamber, and the coefficients of absorption which they found were much smaller. Perfect agreement could not be expected.

If we consider only the effect of the fog in absorbing radiation, the results shown above indicate that deep red light (near infra-red) is more useful than light of other colors with shorter wave-lengths. But in selecting a light for use in fog three other factors must be considered.

1. The relative eye-visibility of different colors.
2. The effect of contrast between the lights observed and their respective backgrounds.
3. The position of the observer relative to the light sources.

In Fig. 5 (International Critical Tables, vol. 5, p. 437, 1929) is shown the relative visibility of the eye for monochromatic radiation (pure spectral colors). This figure shows that the normal eye is most sensitive to yellow-green light, and that the sensibility of the eye falls off rapidly toward the end of the spectrum and likewise toward the blue. The eye is approximately ten times more sensitive to the yellow-green light used in this investigation than to the red, and twenty-five times more sensitive than to blue. This means that in order to have a red, yellow-green and blue source of light (corresponding respectively to the filters used) which would appear of equal brightness to the eye, the radiant energy of the red would have to be ten times greater than that of the yellow-green, while that of the blue would have to be twenty-five times greater. Perhaps this can be better illustrated in another way. Suppose we have three lights (beacons) red, yellow-green and blue respectively, all of equal radiant energy. Assume that in a certain fog the yellow-green light is reduced to 0.1 per cent of its brightness in 289 ft., using the value given in Table II. If the relative visibility of the eye is taken into account, the brightness of the red light will be reduced to 0.1 per cent in 230 ft., while the brightness of the blue will be reduced to 0.1 per cent in 130 ft. of fog. Thus the yellow-green light will be visible at the greatest distance, the red next and the blue the last. From this viewpoint the yellow-green is by far most useful.

The discussion in the last paragraph does not consider contrast. The relative distances to reduce the brightness to 0.1 per cent, 289 ft. for the yellow-green, 230 ft. for the red and 130 ft. for the blue, would hold at night when the background is black. In daylight the fog is illuminated by diffused sunlight, so the beacon lights would be surrounded by a whitish haze. Very little is really known regarding the effects of such a luminous veil upon the visibility of lights. Further tests in the field will be made to determine the effects of contrasts in daylight fog.

The foregoing discussion has been carried on assuming the source of light to be in the nature of a beacon, that is, the observer is in front of it trying to pick up the light. Lights to be used as landing lights on a plane require further consideration. The blinding effect of scattered light produced by the fog is very serious to the person using it to illuminate objects ahead. It has been generally assumed that the absorption of light by fog is due to (1) a blocking-out of the radiant energy from the light beam by the fog particles and (2) by a scattering of light. The first effect is *independent* of the wave-length. Scattering is *dependent* upon the wave-length of light and is greater for short wave-lengths than for long. In the formula previously given, the coefficient of absorption k equals $a + b\lambda^{-4}$, in which a is the blocking-out coefficient, independent of wave-length and $b\lambda^{-4}$ is the coefficient of scattering. This is known as the "Rayleigh Inverse Fourth Power Law." The measurements indicate that the blue and green lights

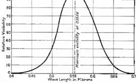


Fig. 5

are absorbed more than the red. This may be due to a greater scattering effect of the fog particles for the light waves of these colors. If this is true, a landing light with a red or orange filter would be far more effective, because there would be less scattered light to blur the reflected light from the objects illuminated. In making such a test, account must be taken of the effect of using a filter on the candle-power of the beam—*the white light and red light must have equal beam candle powers.*

The results reported at this time are not entirely satisfactory and are far from complete. The measurements should be repeated and, if possible, with greater precision. It is intended to try a spectro-photographic method. Furthermore, measurements with infra-red and ultra-violet should be made under identical conditions as those with visible light, if a complete picture of the absorption of radiant energy by fog is to be obtained. This laboratory study is only an introduction to a complete investigation of the problem. Field tests in natural fogs with beacon lights and landing lights of various colors should be made as soon as practicable. The laboratory work will furnish a selective guide as to the colors that offer the greatest promise in value.

TRANSPORT TERMINAL Maintenance

Gassing up a Fokker F-Ten transport at Oakland Airport, California.

A Discussion of Many Different Systems of Maintenance Now in Use at Air Terminals

By Ernest W. Fair

Whether an operator is maintaining a large airline using giant tri-engine planes or operating a short line with low powered machines, the maintenance of planes at the air-line terminal or terminals is a subject of greatest importance to him.

Maintenance has made many an operator the unwelcome gift of sleepless nights not only because of its evident costliness, but because of the scarcity of known procedure, nearly all of which has had to be originated by each airline or developed from contacts between operators. In the ensuing paragraphs an attempt will be made to bring most of the outstanding points of maintenance together, not only for students and future operators, but for those now actually engaged in the task of keeping planes fit.

How often shall a plane be completely overhauled? That is one of the first questions. Some airlines give every plane a minor overhaul each time they overhaul the engines; others have specific periods of time for complete check-ups and overhauls on engines and planes alike. Many lines require a daily inspection, either during the night, or immediately after the plane comes in from its daily run. These check-ups are recorded and even the slightest indication of trouble is attended to.

On the Braniff division of Universal Airlines, this daily inspection of planes is an iron-bound rule. The terminal staff of the Braniff division includes twenty men whose duty is to inspect and repair planes after the daily runs. Braniff's record of a million miles flown without accident is largely due to this vigilance at the terminal. These planes fly from 200 to 500 miles per day so rather than to chance one mechanic having to work too fast to complete his job, two mechanics are assigned to every plane between runs. This allows a much slower inspection. Following a complete check and servicing of a line plane, the job is inspected by a factory-trained chief mechanic. Responsibility for each plane is on the shoulders of this chief mechanic. He makes his report and final check-up on each plane and is responsible for any mistake.

It is entirely proper that such responsibility be centered on one man of the terminal force with sufficient training and experience to enable him to detect the slightest error in the other mechanic's inspections. It is only by such extreme care that accidents and forced landings can be avoided.

Other transport lines, in general, are following plans similar to the one used by Braniff. On the Stout Air Lines, a daily inspection of the planes is made and a service record is kept. All vital points about the engine and fuselage, wings, empenage, controls and undercarriage are checked and filed after recommendations by the operations manager have been carried out. On a single sheet the pilot makes a report of everything noticed in flight that should be altered or corrected. Southwest Air Fast Express, Western Air Express and others also have careful inspection routines.

In most cases it has been found that the engines and their accessories should be given special inspections, entirely separate from the aforementioned general inspection. On Stout and S.A.F.E., as well as a few others, this inspection is left to mechanics who must know the engines from hub to valve. These mechanics perform the servicing also, after a preliminary inspection has been

made, and the report checked for service The job must always receive the final O K of the foreman himself.

With Stout airlines a flight engineer supervises both inspections and makes out the final report Thus he takes responsibility for the entire plane and engine

A desirable additional precaution is a final rigid inspection before the plane is ready Pan-American Airways warms the engines for this final inspection within sight of the passengers, while others prefer to perform the final inspection in the shops before bringing planes to the loading platforms On long lines such as T A T, Pan American, Western Air Express and Universal, a hurried but thorough inspection is made at each terminal after the plane has landed and before it takes off At the present time much work is being done in the erection and equipping of intermediate terminals, and the larger airlines are formulating plans for even more such construction in order that planes may at all times and on every point of the route be in as perfect condition as it is possible to make them.

Perhaps one of the points that is most easily overlooked in the preliminary design of these auxiliary terminals and line shops is the matter of electric light and power provision which cannot always be secured from power station lines There have been fully a half dozen cases where the lack of provision for such facilities in the beginning meant very sizable expenditures later For the most part, direct hookup with power lines is advisable, but some organizations have found that electric light and farm-power units not only prove economical but convenient, their initial cost being the main point to consider In most major shops, though their initial expense is somewhat high, operators have found that the use of electrical tools saves them considerable expense in the long run for it permits more precise jobs than hand tools, besides quicker operations and in many cases less strain on mechanics or repairmen.

The necessity for providing adequate fire-fighting equipment is almost too obvious to need mention although some operators have neglected it with subsequent serious losses to themselves Facilities for heating the terminal building, and for heating water and oil must also be included in all complete plans

The insistance of some manufacturers of large transport liners that only men trained in their factories be used for maintenance work is thoroughly reasonable S A F E, Braniff, Maddux, Boeing and others require that all their foremen and inspectors have factory training on the planes they work on All Braniff mechanics have had short periods of factory training which makes them thoroughly familiar with every part of the planes they work on, and permits them to turn out highly efficient jobs. S A F E does not allow a new employee, unless he is thoroughly familiar with the work from previous association, to step into line He must serve for a training period in the shops until the chief mechanic is assured that the man understands what he has to do and how to do it

IT HAS BECOME an almost universal practice to install underground service tanks for gasoline at terminals Reduction of fire hazard, convenience, and in general, actual economy, although these tanks cost somewhat more, have proven to be the result Great Lakes, Western Air Express, S A F.E and numerous others have adopted them Neither tanks nor pumps are located in the buildings but on roads and runways, aiding in servicing and refueling at auxiliary terminals These lines have found it advisable, however, to place such tanks fifty to a hundred feet from every building other than the gas and oil houses, to aid in multiple servicing if such is necessary

The use of dollys, particularly with small planes not equipped with tail wheels, has been found efficient on the majority of lines

There has been a good deal of guess work in equipping terminals and auxiliary terminals with the proper tools To formulate a list of tools and equipment necessary would be no easy job, for such needs vary considerably However, there are definite standards about which equipment can be grouped as practiced by the greater majority of lines

Portable stand used in the repair of water cooled or air cooled in line engines

For auxiliary terminals or shops, one or two benches are all that may be needed, with a few hand tools, a carpenter's vise and a small machine vise Where metal planes are used, special riveting tools are of course necessary Special equipment and tools for grinding valves and cleaning engines are absolutely essential

Where only minor repairs are made, usually following orders in inspection check-up sheets, there are a definite number of small tools desirable. Hoists equipped with smaller sizes of chain blocks with capacities from 100 to 2000 lb are not only inexpensive but highly desirable Worm and spur geared hoists have proved highly successful in many shops The former is cheapest but general recommendation seems to prefer the latter Larger terminals should be equipped as are S A F.E and Standard terminals with overhead tracks for chain tackles for ease and speed of service

It has generally been found that ready made metal motor tests stands are the most desirable, at least for complete engine overhauls Torque brakes for measuring horsepower, tachometers, and oil pressure instruments will certainly prove well worth their expense in this use Stands should be equipped with adjustable engine supports which can be set to accommodate any engine, if the air line uses a variety of planes and engines Gas and oil feeding sysems and measuring instruments should also be taken into consideration for major overhaul work. Special wrenches for each type of engine and a few machinists' hand tools are necessary in all shops, terminal or auxiliary. Galvanized iron pans for washing of engine parts in kerosene during overhauls, pressure systems for use in such washing and other like accessories have proven their value in more than one instance

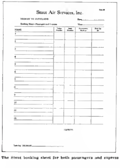
Complete checking cannot be done without jigs for checking of the ignition equipment of each engine These can either be built in the shops or better still, procured from manufacturers Checking operation of the distributors and readjusting them can be quickly accomplished through the arrangement of dummy setups before they are reassembled with the engines

There is less and less tendency, and in fact very little with the major airlines, to send engines back to the factory for major overhauls as has been done in the past With the training of mechanics in the factories and the availability of highly efficient tools such procedure is becoming more and more unnecessary This means a decided saving in costs for any transport operator.

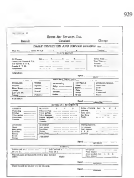
Tool and equipment lists are about as variable as the type of passengers the airline carries. The following list has been compiled after careful consideration of the average equipment used by several major airlines

Carpenters' small tools and benches, double-spindle shaper, jointers, fuselage jigs and benches, electric hand drills, steam box or boxes, portable vacuum cleaner, propeller repair tables and tools, soldering iron heater and soldering equipment, hard wire hook benders, pipe benders, blacksmith's forge (small), power hacksaw, two-way builders levels riveting equipment for metal planes, chain blocks and tracks, machinists' small tools, kerosene washing pans, piston and rod-displacement jigs and straightening tools, a compressed air system for cleaning parts with bench hose, machinists' benches, screw-cutting lathes, engine tool stands, small circular saw (band saws are often desirable too), wood planers wing jigs and benches, glue pots sewing machine (for fabric coverings), propeller balancing stand, sheet metal workers' tools, small sheet-metal beader, sheet-metal cutter, wire and cable proof loaders, acetylene welding set, 200-pound blacksmith anvil, wheel repair stand, wing panel trailer, engine overhaul stands, special engine tools for each type, arbor press (small), ignition testing setups, valve truing tools, main bearing line reamers, kerosene pressure spray system for cleaning parts, gear pulling clamps, piston and rod scales, stationary oil cans, either faucet or pump

AVIATION
May 10, 1930



The Stout booking sheet for both passengers and express



Daily inspection and service record used by Stout Air Services, Inc.

A list to meet individual requirements must, of course, be worked out by the chief mechanic in charge at every terminal where servicing is done, this list is given merely for purposes of suggestion and comparison It may be pointed out, however, that in the experience of most transport operators maintenance costs are ultimately reduced in proportion to the completeness and efficiency of equipment, and that attempts to reduce first cost here are usually very poor economy

The whole questions of maintenance cost is one which must be worked out by each company for itself, and is one about which generalizations are not particularly valuable. Every operator knows that failure to keep planes and engines in perfect condition must eventually result in greater expense than saving in the cost of servicing

Nevertheless, maintenance costs need not be proportionally exorbitant Carefully kept records should reveal just how often overhauls of engines are necessary, and a regular schedule can easily be worked out which will keep equipment in perfect condition at minimum expense The expense can be further reduced by so arranging the schedule that the shops at the terminal or terminals will be kept more or less constantly busy, instead of having alternate periods of idleness and excessive amounts of work on hand The Braniff lines have taken this factor very successfully into consideration by taking planes to the central shops at the conclusion of each run, thus insuring the delivery of planes for servicing at comparatively regular intervals

In this as in other respects, operators will find that expenses incurred in analyzing maintenance needs and preparing routine methods for meeting them will be amply repaid later Hit-or-miss methods of developing service for transport planes are always expensive in the long run, from the point of view of actual expenditure as well as of safety

Thirty Cent Protection FOR A *MILLION DOLLAR SHIP*

By L. C. PORTER
Engineering Department, Edison Lamp Works
Harrison, N. J.

LIGHT'S GOLDEN JUBILEE brought to the attention of the World, the marvelous advance made by the lighting industry during the past 50 years. Never before has so much beauty been on display, or so many activities of our present regime been made possible,—in fact, dependent upon light.

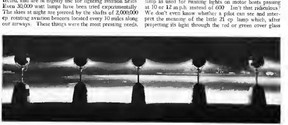
Naturally we would expect that our latest form of transport, aviation, would to a large extent depend upon light. So it does. The thing that has made the air mail successful is night flying. Night flying depends upon lighted airways and lighted airports. The air mail is largely responsible for the success of commercial aviation. A marvelous future is open to air transport. History shows that each new form of transport has developed faster than the previous one. This is outstandingly true of flying. In fact, aviation has developed so rapidly that the lighting has not kept pace with the developments in engines, ships, radio, etc.

True, advance has been made in the more evident needs of lighting for night flying. Field floodlights have been developed of new and novel design using 24 KW. of lamps. MAZDA lamps 10,000 watt size have been perfected, and are in nightly use for lighting aviation fields. Even 30,000 watt lamps have been tried experimentally. The skies at night are pierced by the shafts of 2,000,000 cp. rotating aviation beacons located every 10 miles along our airways. These things were the most pressing needs, and the most evident ones; therefore, naturally the first ones developed. Let us see, however, some of the things that have not been done.

Present practice is the result of the unprecedented growth of aviation. It has advanced so rapidly that new types of lighting equipment could hardly be devised and built fast enough to meet the new conditions as they arose. We have hardly made a start. Let us pause a moment and discuss some of the things to be solved for the future.

Not so very long ago, the dug out canoe of the Indian was quite a boat. The great transatlantic liner of to-day was absolutely beyond conception of the owner of such a canoe. There is no fundamental reason why the airship should not have a similar, or even greater growth. The small, single passenger planes of to-day will probably bear the same relation to those of the future that the canoe does to the transatlantic liner. We already have evidence of such development in the recent flights of the Dornier plane with 169 passengers and a capacity of 200.

Speeds of over 300 m.p.h. have been obtained. Assume two planes passing, each traveling 300 m.p.h. The net passing speed would be 600 m.p.h., or 840 ft. in a single second. If these planes are flying after dark, the lives of at least two people and many thousands of dollars worth of material depends upon the pilots seeing each other's approach and avoiding collision. The navigation lights on these planes to-day are 21 cp. lamps,—the same lamp as used for running lights on motor boats passing at 10 or 12 m.p.h. instead of 600. Isn't that ridiculous? We don't even know whether a pilot can see and interpret the meaning of the little 21 cp. lamp which, after projecting its light through the red or green cover glass



Fresno Airport, Calif., lighted by a bank of 3,000-Watt landing lights

A Neon aviation beacon in operation

of the navigation light, is reduced to about 4 or 5 cp. moving 600 m.p.h., and yet we are staking our lives on such equipment.

We have great dirigibles, slate color, offering practically no color contrast with the sky and the cloud background, ships nearly a thousand feet long moving at 80 or 90 m.p.h. and protected by a single set of running lights—the same tiny cp. lamps. It is nothing but good luck that has so far prevented these ships from being run into by some fast-moving plane. Think of it, a million dollar ship protected by navigation lights that cost about 30c. Would it not be common sense and good business to put adequate navigation lights on these ships, spending a few dollars, or even a few hundred dollars to adequately protect a million dollar investment and the lives of many people?

To-day we are using white lights for aviation beacons to guide the pilot along the airways, and to the landing field. A white light is used no matter whether the beacon is located in the middle of the prairies with no other light in the range of vision, or amid the myriads of other white lights such as signs, street lights, headlights, etc, in and around great cities. We have plenty of evidence and experimental data proving conclusively that under the latter condition, a colored beacon even of much lower candlepower can be picked up farther away, and more definitely identified than a white beacon. This is due to color contrast, and yet we do not use colored airway beacons. Why?

We use the same type and size of beacon on our airports as on our airways. Assume Tom, Dick, or Harry,—you or I—approaching a city from which several airways radiate. Assume the weather slightly thick, and our gas supply low. It is essential that we reach the airport in the shortest possible time. How are we to know whether the beacon we are steering for is at the airport, or on an airway? Airports should have more powerful beacons than those on the airway,—beacons which are entirely distinctive, giving a radically different type of indication from that given by airway beacons.

Some Very Interesting Comments and Comparisons of Present Day Aeronautical Lighting Facilities

Fog penetration is another problem which is far from solved. More attention is being given this problem than some of the others, yet there are certain rather simple and really fundamental things that we do not yet know. For example: nobody knows definitely whether or not a large area of fog lighted to a relatively low intensity can be seen farther than a small area lighted to very high intensity. In other words, in fog would a given amount of light be more effective if concentrated into a narrow and very powerful searchlight beam, or spilled out through a large area of fog? Perhaps airports should have two types of beacons; one, best suited for use in clear weather, and the other for thick weather.

In either case, how can the light be used to best advantage? We have plenty of data to show that if the present airway beacons rotating six times a minute, and having a horizontal beam spread of about 12 deg. are stopped in their rotation with the beam pointed directly at an observer several miles away, the beacon appears to grow bigger and more brilliant; i.e., it becomes instantly more conspicuous and more effective. Evidently then the present flash period is not long enough to take advantage of the maximum response of the human eye. Just what is the relation between beam candlepower and flash period? We know that a quick flash will attract more attention when the observer is not looking directly toward the light source, while a slow one seems more conspicuous if looking directly at the beacon. Which is of more value to the pilot? What combination of the two will give the maximum range to a beacon when observed from a fast moving plane? We don't know, and yet we are trying to see our beacons as far as possible, or to see them at all in quick weather.

LEAVING the beacon, consider some of the lighting problems on the airport at night. We mark the boundary of the field by a string of white lamps,—identically the same size and type of lamp that is used for street lighting. In several places the boundary lights of an airport parallel a line of street lights. I'll defy anyone who is not an experienced pilot, familiar with such a field, to go up a couple of thousand feet and tell which row of lights marks the boundary of the field and means a safe landing. The old and experienced pilot, yes, but we must anticipate the time when there will be as many and as great a variety of people in the air as now drive automobiles. It is for that class of flyer that we must plan our lighting,—not for the thoroughly trained pilot of long experience.

Compare the lighting of our landing fields with any

other night activity for which artificial light is used Here are just a few of the intensities in common use

Bathing Beaches	½ Foot Candles
Office Lighting	10 Foot Candles
Machine shops	12 Foot Candles
Drill Fields	2 Foot Candles
Store Lighting	10 Foot Candles
School Lighting	8 Foot Candles
Skating Rinks	5 Foot Candles
Tennis courts	15 Foot Candles
Street Lighting	¼ Foot Candles
Football Fields	4 Foot Candles
Playgrounds	2 Foot Candles
Railway Yards	¼ Foot Candles
Swimming Pools	3 Foot Candles
Auto Parking	½ Foot Candles

Averaging up the recommended intensities in 361 after-dark activities, we get 8 1 foot candles A similar average of 59 after-dark outdoor activities shows 5 4 foot candles Compare this with what we are using on our landing fields to handle ships coasting thousands of dollars and involving human life The Department of Commerce requires 15 foot candles for an A-1-A rating, —only three times the intensity of full moonlight To meet this requirement projector units of about 20 KW capacity are used on averaged fields These produce lighting that would be roughly the equivalent of the light obtained from a single candle set in the center of a room 20' square Go home and try it, if you think that is adequate lighting for safety!

Many of our aviation fields have hard-surfaced runways for landing and taking off To land on a runway, a pilot should be able to see its surface We see an object by means of the light that is reflected from its surface back to our eyes Yet look at many of our latest runways—black surfaces, cinders, asphalt, etc Such surfaces soak up light as a sponge absorbs water For example, here are the reflection factors of a few materials in common use for surfacing runways:

Asphalt	5 per cent
Cinders	5 per cent
Black Soil	8 per cent
Sandy Soil	10 per cent
Clay soil	20 per cent
Gravel Soil	20 per cent
Crushed Slag	20 per cent
Crushed Stone	25 per cent
Portland Cement	25 per cent
Crushed Stone Whitewashed	75 per cent
Fresh Whitewash	80 per cent

Suppose we took an ordinary street sprinkling cart, and whitewashed a typical asphalt runway It would then appear 10 times as bright as before whitewashing Or, in other words, for a few barrels of whitewash we could obtain the equivalent of 10 times more light Furthermore, such treatment would prevent the present difficulty of landing on top of the beam when there is a ground haze or fog Pilots mistake the top of the field floodlight beam for the ground, because the grey particles of fog are better reflectors of light than the black ground surface If that surface were white it could be seen through the fog Then floodlights could be mounted higher and do a much more efficient lighting job No longer would slight rises of ground cast long, deep shadows that from the air appear like ditches or yawning chasms.

Only a short time ago I had an opportunity to visit a magnificent aviation field, where no money has been spared in development One of their runways was black asphalt Along the side of this had been placed a strip of grey crushed stone in an attempt to at least mark the edges of the runway The field floodlight projector was mounted about 12 ft above the ground, and a thousand or more feet from this particular runway In that position the light came out at such a low angle that the 6-in of stone above the edge of the runway cast a perfect shadow entirely across its 100 ft width, and the runway itself looked like a bottomless pit That is a good example of some of the practical things which happen under service conditions that are not anticipated when the lighting is planned and laid out in the illuminating engineer's office

Some day, some one will have the courage of my convictions and erect a high tower in the center of a large

A Boeing mail plane taking off from Oakland Airport at 4 A.M.

aviation field This tower will be outlined, using red lights This will also be a mooring mast for dirigibles It will contain the control offices for the field, and from the top lighting units will project light downward in a serviceable efficient manner all over the field This will not only provide efficient lighting, but also a system practically free from glare

Glare is the inevitable accompaniment of high power light sources when they are in the direct line of vision, or nearly so Glare is a menace to pilots in landing, and a hazard in taxi-ing in to the hangars when they are located near the floodlight projectors I doubt if anyone will ever produce such a thing as a glareless light What can be done and done now, however, is to locate *several* powerful field floodlights around the field, and use those which enable the pilot to land with the lights back of him, and at his side, instead of in front of him The projectors used will depend upon the direction of the wind

It is really futile to try and light as large an area as the modern aviation field from a single high power projector, or battery of projectors Provision should be made for the installation of at least 200 kw. of field floodlights located at about eight positions around the field

None of our present airports has an adequate traffic control system Radio 'phone, yes But, the future flivvers of the air will not all be equipped with radio Some simple and effective visual signal system must be in use to advise those in the air of conditions on the ground So far, such a development has been almost entirely neglected

THE *Boeing 80-A*

By Frank Canney

New Hornet-Powered Plane Designed to Accommodate 18 Passengers, or 12 Passengers and a Mail and Express Cargo

DESIGNED primarily for large capacity transcontinental passenger service or combined passenger and mail-express operations the Boeing 80-A tri-engined transport, with accommodations for eighteen passengers or twelve passengers and mail cargo, has been produced and successfully subjected to intensive tests on the western division of the transcontinental air mail route A fleet of twelve transports has been completed by the Boeing Airplane Company, for use by Boeing System for a twenty-hour all-plane service between Chicago and San Francisco Bay This air transport company has been operating a number of the new tri-engines over the Cheyenne-San Francisco leg of the route for some time

Model 80 A is similar in most respects to the Model 80 produced in 1928 at the Boeing plant, except for Hornet instead of Wasp engines, increased gap and stagger, bolted square duralumin tubes in place of welded steel, and changes in the body to permit the plane's use as a combination mail and twelve passenger transport or as an eighteen passenger plane It is powered with three Hornet engines, developing a total of 1,575 h p

The span of the upper wing is 80 ft, and the lower is 64 ft, 10 in The overall height is 15 ft, and its overall length is 56 ft, 6 in The total wing area is 1,220 sq ft, the upper wing being 800 sq ft and the lower 420 sq ft The spars are trusses, built of rectangular dural tubing Chord members are square sections being 1¾ in square in the upper wing and 1½ in square in the lower Diagonals are rectangular, with the long dimension equal to the square dimension of the chord members

Trusses are formed by bolting members together through dural gusset plates, and dural bolts are generally used although steel bolts are used at some of the heavier stressed joints, as, for example, at the landing gear fittings and the larger drag wires Drag struts are trussed and are similar in construction to spars All brace wires are double except in the tank bays, and are attached to the spars through the chord member center lines

BOTH upper and lower wings are in three panels: the center sections, which are attached above and below the body of the transport by four bolts each, and the outer panels, attached to either end of the center sections by two hinge bolts each The chord of the upper wing is 10 ft, while that of the lower wing is 7 ft 4 in In the design of the Boeing transport, special attention was given to fairing the wings into the body by means of curved-metal plates The ribs are riveted dural trusses, with tubular chord members The diagonals are dural channels, except in cases where the loading required tubular sections Wings are covered with fabric, with the exception of the upper side of the lower center section, which is covered with a metal sidewalk, useful in loading mail or baggage, protecting the wings from gasoline and oil, and also giving access to the nacelles

Ailerons are of the Frise type, and are secured to

the upper wings by five hinges each. They are operated by two masts to each aileron, the entire mechanism being housed within the wings The ailerons extend along the outer half of the upper wing span, their total area being 100 sq ft Hinges, pulleys and other parts are equipped with ball bearings throughout

The nose of the fuselage, as far back as the rear wing hinges, is constructed of chrome molybdenum steel tubing From the wing cellules aft, the construction is of bolted square dural tubing The side members of the fuselage have been held to a constant size, 2¼ in square, over the length of the cabin This is done to simplify the attachment of the cabin insulation, window frames and fairing strips

Fuselage bracing is designed to give unobstructed window openings The windows are "fixed," fresh air being supplied by individual adjustable ventilators, located at each window In addition, there are large air intakes at either side of the cabin to the rear Heated air is supplied by stoves placed around the exhaust stack of the center engine, is fed into the cabin and carried along either side to the rear The stove is constructed with a venturi so that when heat is not required, the warm air registers function as dead air exhausts and thus materially aid in ventilation

The individual ventilators are manufactured commercially by the "Window Muffler Co" and bear the trade name "Aero-vent" They consist of a retractable scoop about 6 in deep, which may be projected out about 2½ in from the side of the plane, a box in which the scoop and mechanism for operating it are housed when retracted, and an operating lever for adjusting the scoop to any desired position The scoop housing serves as the air duct, the rear face being covered with an ornamental grille.

The tail end of the airheating stove is in the form of a venturi, with a butterfly valve to the rear of the throat The hot air outlet is placed at the throat, but when the butterfly valve is opened allowing air to exhaust freely through the rear of the stove, the resultant reduction of pressure at the throat of the venturi causes a reversal of flow through the hot air ducts, and the registers thus become exhausts for dead air

The floor of the Boeing transport's cabin is built up of dural "I" beams running athwartship at fuselage station points, while the stringers are rovered "U" channel sections These members are covered with corrugated dural, which in turn is covered with a sheet of flat dural at points of wear, such as the aisle Each chair leg comes directly over one of the stringers Chairs are rigidly attached to the floor by means of specially designed locking fittings, so devised that the chairs may be readily removed, and, if desired, alternate rows may be made to face each other

THE CABIN is divided into two compartments, separated by a door The forward compartment, directly behind the pilots' cockpit, may be used to accommodate three passengers or 1,400 pounds of mail and express The compartment is 6 ft 6 in high, 5 ft 4 in wide, and 4 ft 2 in long Three doorways lead from this compartment. one to the pilots' cockpit, one to the main passenger cabin and a third to the lower wing sidewalk, which may be used as a mail loading door In transports built primarily as combination mail and passenger carriers, this compartment is metal lined, while in planes to be used for passenger transport operations exclusively, the walls and ceiling are finished with mahogany plywood to correspond with the main cabin

The main passenger cabin is 15 ft 3 in in length, and is the same width and height as the smaller forward compartment. Seats, made of laminated black walnut and upholstered sedan fabric and weighing 13 lb, are arranged in six rows of three each, with an aisle between the second and third seats from the left Windows, 18 in wide and 20 in high, are conveniently located at either end of each row of seats Smaller windows, 18 in. wide and 12 in high, are placed at the rear of the cabin, one in the lavatory and one in the main entrance door All windows are equipped with non-shatterable glass

The cabin is finished with highly polished Honduras mahogany plywood, which has a thick core of balsa wood for sound insulation This sound-proofing feature permits normal conversation among passenger while the plane is in flight Individual electric lights are located by each seat Altimeter, air speed indicator and clock are affixed to the forward wall of the cabin for the benefit of the passengers The lavatory is at the rear of the main cabin, it has an average height of 6 ft 1 in, and covers an area approximately 2 ft 6 in wide and 4 ft 6 in long The lavatory is featured by hot and cold running water, the hot water being kept at a temperature of 180 degrees F by a 120 watt electric heating element in the three-gallon tank above the ceiling of the compartment

A cloakroom, furnished with hangers, is located to the rear of the main entry way, and occupies a space 2 ft 6 in wide, 2 ft 8 in long and 5 ft 11 in high A panel at the rear of this compartment gives ingress to space in which is placed radiophone equipment

THE PILOT'S COCKPIT is located directly to the rear of the nose engine fire wall and its floor is raised 2 ft 11 in above the main cabin floor, thus providing a compartment of 39 cu ft below it which may be used for express and baggage This also provided ingress to the controls, wiring and plumbing leading from the cockpit The extensive window areas in the cockpit are of non-shatterable glass, the front windows, ¼ in in thickness, are divided along the renter line and may be fully opened by a worm and wheel mechanism, the top half swinging upward and the lower half downward The side windows may be cranked upward or downward to a fully opened position Excellent visibility is thus provided in all types of weather A double hatchway in the roof of the cockpit is made of green pyralin, for vision above, and being divided along the center and hinged at the sides, it opens upward and out This hatch provides access to a walkway on top of the fuselage, leading to the main tank filler units The cockpit is metal lined up to the windows, and heat is provided from the hot air stove on the center engine exhaust stack.

Various instruments and controls are conveniently grouped on one large instrument board, which is built in three removable sections Flight instruments are grouped on the left panel directly in front of the pilot's seat, and include the following air speed indicator, rate of climb indicator, bank and turn indicator, and a large extra sensitive ball bank indicator

The compass is mounted behind the pilot, but is read through a mirror conveniently located above the instrument board The central instrument panel includes engine instruments as follows tachometers, oil pressure and temperature gages and fuel gages The right panel carries the time of trip clock electrical meters and light switches, with the exception of the landing lights, switches for which are located on the side of the pilot's

adjustable seat The instruments are indirectly lighted, and the intensity of the lighting may be varied by means of rheostats.

Dual wheel and column controls for ailerons and elevator are positively inter-connected, and rudder stirrups, adjustable to three positions, are provided for both pilots Differential braking is provided through pedals on the pilots' rudder stirrups. Brake and flight control cables are $\frac{3}{16}$ in. extra flexible and ball bearing Micarta pulleys are used throughout Throttle and mixture controls are operated by rods, except where bends occur, in which case Abreus units are used

The stabilizer adjusting mechanism is controlled by a torque shaft mounted in roller bearings which carry thrust as well as radial loads An adjusting truss is provided to carry the front stabilizer spar in such a way that all loads are transmitted directly, not being carried as bending or torsion.

ALL ENGINE CONTROLS, hand brake and landing light retracting cranks are centrally located within easy reach of either pilot's seat, and are mounted in a stand of special construction Engine controls include a hand fuel pump, master ignition switch, ignition switch to each engine, main 3-way fuel valve, electric inertia starter controls, carburetor heat control, engine shutter controls, engine primer pump and valves, and booster buttons Pressure fire extinguishers for each engine compartment are controlled through handles at the base of the control stand, and a total of four parachute flares are carried with positive controls to the pilot and co-pilot

The familiar landing gear of the Boeing transport is of the treadle type with two Boeing oleo units for taking up the shock from each wheel. Wheels 54 in. by 12 in with tires of the same size are used Wheels are equipped with roller bearings and brakes, which are 20 in. in diameter and carry 2 in. bands All connections are effected with straight pins as no universal action is required in the treadle type gear

A landing gear tread is 18 ft 2 in The axles have forged knuckle fittings. The bearing ends of the axles are ground to 3¾ in O D. and no inner bearing race is required, while the main portion of the axle is made of 2¼ in. O D tubing. Both parts of the axles and the four drag struts are made of chrome molybdenum steel tubing, and are heat treated to give a tensile strength of 180,000 pounds per sq in. The drag struts are made from 3½ in. O D. tubing, formed to a streamlined section by drawing. The inner leg of the oleo comes directly over a jack platform on the forged knuckle, and embodies a self-contained extending jack which is used to relieve the spring load on the outer oleo when it becomes necessary to remove the outer half of the landing gear in changing a wheel or tire. Bolts are placed in such a way that add the brake torque is taken by the drag struts. All landing gear attachments are made directly to the spars of the lower center section.

The 15 in by 3 in special cast alloy tail wheel is equipped with roller bearings and a solid rubber tire It is mounted in a castor fork which can rotate through 360 degrees. The tail wheel shock is absorbed by a special Boeing oleo unit, and the whole is faired between the body and the rudder

The main nacelle connections come directly over the wheel centers, and the structure is entirely of chrome molybdenum steel tubing, including the interplane struts. The controls to the nacelle engines are carried out from the body through the leading edge of the lower wing, and are readily accessible when the specially hinged leading edge is swung up out of the way The outer interplane struts are of streamlined dural tubing All brace wires in the wing cellule are of a streamlined section, and the lift and landing wires are brought into trunnions on the spar center line

The nacelle engines are 20 ft. between centers The nose engine is equipped with a two-blade metal propeller of special design and is 10 ft. in diameter, while each nacelle engine carries a 9 ft 6 in special three-blade metal propeller The engines are series B Hornets, each of which develop 525 hp at 1,900 r p m Fuel tanks are located in the upper center section, standard equipment consists of two 165 gal main tanks with a 70 gal. reserve tank, but provision has also been made for carrying 500 gal of fuel in two 250 gal tanks All tanks are made of 050 welded aluminum Main fuel lines are ¾ in O D copper tubes, and provision is made for feeding all engines from any one or all tanks Each engine is equipped with an engine-driven C-5 pump

Oil is carried in welded aluminum tanks directly behind each engine, each of which is equipped with an oil temperature regulator This is in the form of an oil radiator, just inside the adjustable nose shutter All engine cowling which must be removed for servicing purposes is attached by means of special Boeing cowl fasteners permitting easy and rapid removal

The fixed surfaces of the empennage are made entirely of metal, as on recent Boeing fighters, the covering being 016 Alclad The rudder and elevator are of conventional welded steel tubular construction, fabric covered The trailing edge of the rudder carries the tail light, which is of special design The areas of the tail surfaces are as follows: fin, 14 3 sq ft.; rudder, 34.7 sq ft, stabilizer, 79.2 sq ft., and elevator, 75 4 sq ft

The loading differences of the 80-A as an eighteen-passenger transport and as a twelve-passenger and mail-express carrier are as follows:

12-Passenger and Mail-Express

12 Passengers at 170 lb	2 040 lb
Baggage at 45 lb. per passenger	540 lb
Mail and Express	1,436 lb
Total Payload	4 016 lb.

18-Passenger Transport

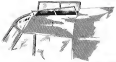
18 Passengers	3 060 lb.
Baggage	898 lb.
Total Payload	3,958 lb

The difference in the total payloads is due to additional equipment, such as chairs, in the eighteen-passenger version of the transport To convert the 80-A into a twelve passenger plane capable of carrying over 1,400 lb. of mail, it is necessary only to remove six chairs, which can be accomplished in 5 min. by one man

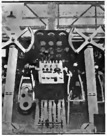
Specifications

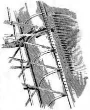
Length overall	55 ft
Height overall	16 ft. 2 in.
Upper wing span	80 ft.
Lower wing span	64 ft 10 in.
Chord upper wing	120 in
Chord lower wing	88 in.
Wing Section	Boeing Number 106
Wing Area	1 250 sq.ft.
Weight empty (18 passengers)	10,417 lb
Weight empty (12 passengers)	10,357 lb.
Useful load (18 passengers)	7,083 lb
Useful load (12 passengers)	7,143 lb
Wing loading	14 lb /sq ft.
Power loading	11 8 lb /hp.

DESIGN DETAILS OF THE *Boeing 80-A Transport*



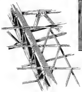
The hinged double Pyralin hatchway providing access to walkway on fuselage top from pilot's compartment



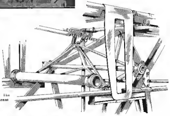


Detailed sketch showing upper wing structure and square tube compression member of bay nearest the tip. The corrugated surface is the aileron.

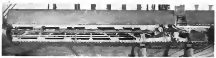
Photograph showing the control compartment which contains approximately 80 units. Note the segmented wheels



Sketch showing detail of spar construction

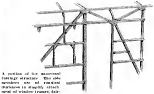


Sketch showing the stabilizer adjusting truss



Photograph showing how removable leading edge gives access to control rods, cables and electric wire

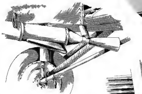
Close up of the lower wing showing main supporting struts for engine nacelle.

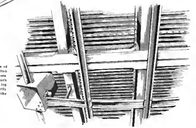


A portion of the uncovered fuselage structure. The side members are of constant thickness to simplify attachment of window frames, fairing and insulating material

Close up of the tail unit of the Boeing 80 A

Sketch showing the hot air sleeves placed around the exhaust stack of the nose engine. The Venturi at the end of the larger sleeve makes it possible to use warm air registers in the cabin to serve as exhausts for dead air when heat is unnecessary





Sketch of details of floor construction from the bottom. The layout is such that each chair leg is located directly above one of the stringers.

GENERAL NEWS

Herbert F Powell, *News Editor*

New York Show Draws Large Craft

Collection of Transports Features $2,000,000 Display

NEW YORK (N. Y.)—Presenting to its visitors the finest assemblage of transport carriers ever exhibited at an air show in this country, the two-million-dollar New York Aircraft Salon is now in progress at Madison Square Garden, where it was opened on May 3. It ends Sunday, May 11, at 11 p m.

Six large craft—three landplanes, one amphibion, and two flying boats—forming a most colorful group and offering one surprise after another to laymen examining their luxurious appointments, greet the gaze of spectators upon entering the main arena.

High above the mammoth airliners are hung ten craft of various types and sizes while some thirty more machines and gliders are shown on the exhibition floor On a tier surrounding the transport machines, and all around the craft on the lower floor, are booths housing engines, accessories and parts, thus giving one a complete idea of what goes into the making of aircraft

Opening Ceremonies

The New York show was officially opened at 8 o'clock, on May 3, by Police Commissioner Grover C Whalen, who made a short speech and then inspected the show with some of his staff Included in the party were Rodman Wanamaker, 2nd, supervisor of the New York Police Air Service Division, Capt Arthur W Chamberlain, secretary to the Commissioner, and Capt Arthur W Wollander, active head of the N Y Air Police.

Charles L Lawrance, vice-president of the Aeronautical Chamber of Commerce, which is staging this Class "B" exposition, also said a few words and a telegram of congratulations from Governor Franklin D. Roosevelt was read.

Before the doors had closed Saturday midnight, approximately 10,000 persons had already visited the salon while Sunday's attendance figure was put at 15,000

Many Planes Over City

Shortly after noon on Saturday more than two-score planes recruited from Curtiss-Wright bases in the vicinity flew over the city in various formations, led by a tri-engined Ford This armada of the air was gathered in less than 24 hr notice after it was found Army planes scheduled for maneuvers would not be available on time due to the recent Pacific Coast exercises of the Army Air Corps units

Through a hook-up arranged by the National and Columbia broadcasting systems with the Western Electric Co, a description of the flight over New York was broadcast from the Ford over a two-way telephone system to 110 radio stations throughout the country. Capt Eddie V Rickenbacker piloted the specially equipped machine, while his passengers listened to greetings radioed from famous fliers stationed in Madison Square Garden

To refer again to the show itself, the placing on view together of the F-32 tri-engined Ford, Curtiss Condor Sikorsky S-38, Commodore Flying Boat, and Savoia Marchetti S-55, the last two for the first time in a U S show, is the most important event in the exhibition

Club Car Facilities

These machines, which cost the Garden management between $18,000 and $20,000 to bring in due to their size which necessitated drastic building changes, offer proof to the public that air travel has reached a point in comforts, facilities and refinements comparable to those found on railroad Pullmans

A color scheme of green and yellow is employed in the streamers and drapes furnishing the exposition's decorative effects, though the numerous attractive girl pages that catch the eye are garbed in red flying outfits.

Among the booth exhibits drawing many interested spectators are those offering small moving pictures of their wares engines and parts in operation or strikingly appareled displays

On the exhibition floor three aviation moving picture shows held in a small auditorium by the Aeronautical Chamber of Commerce on Sunday played to such packed houses that it was decided to give four shows daily thereafter

The two Packard Diesels displayed by the Packard Motor Car Co—one with sections cut-a-way and in operation—occasion much interest and many questions. Another Packard Diesel is included in the Detroit Aircraft Corp section, while a Ryan and Waco on the floor are powered with Diesels In the Isotta Motors Co engine group, show patrons stop to marvel at the 18-cylinder Isotta-Fraschini

One side of the mezzanine near the railing is covered for 114 ft by a full-size, length section composition model of the Sikorsky S-40 a 47-place amphibion, two of which have been ordered by Pan American Airways and are expected to be ready for service early next year

Down in one corner of the exhibition floor is a booth operated by Link, Inc maker of aviation trainers For a small sum, one can get in the trainer and ascertain his or her natural flying sense and ability by attempting to keep the ever-moving machine in an even-flight position

Exhibit Antarctica Pictures

The New York *Times* offers a large collection of aeronautical photographs and maps, the highlights of which are pictures taken by Rear Adm Richard E. Byrd and his party at the South Pole. In the New York *Herald-Tribune's* large booth a model of the Navy ship ZRS-4 now under construction at Akron, Ohio is most prominent

New York City and State are represented in the exposition the latter by a large scale map with flashing electric lights indicating the location of all airports in the state Twice daily coda weather reports are received at this booth from one of the airport weather bureaus

A view from the balcony of the Garden as the final arrangements were under way in the main hall

A display planned by Second Assistant Postmaster General W Irving Glover features all the air mail stamps issued to date, an illuminated map of all cities served direct by air mail, and charts showing the different sections of air mail transportation is being exhibited by the Post Office Department.

Sunday, May 4, was known as educational day and many children were in evidence. Addresses during the afternoon were made by Professor Roland H. Spaulding, educational specialist of the Daniel Guggenheim Fund Committee on Elementary and Secondary Education and Lieut Comdr John W Iseman Commander of the Third Naval Training Squadron, Rockaway Beach, L. I

As well as music broadcast for the entertainment of patrons, the show committee has arranged a large number of speeches and other features, while the Aeronautical Chamber of Commerce, the Society of Automotive Engineers, and the American Society of Mechanical Engineers are holding important meetings. [A day-by-day program of events was published last week in Aviation, p. 889, while the list of exhibitors appeared on p 887 and 888 of the same issue.]

Several Hundred Take Flights

It was reported that on Sunday some 500 persons made use of the reduced flight price offer arranged for those presenting show stubs at airports in the metropolitan district. This special rate was made possible by the Curtiss-Wright Flying Service, Newark Airport, Atlantic Air Service, Eastern Aeronautical Corp., and Roosevelt Flying Field

A list of show craft follows Fokker F-32, Consolidated Commodore, tri-engined Ford Club Savoia-Marchetti S-55, Sikorsky S-38, Curtiss Condor, two Whittelsey Avians, Bellanca seaplane, D A C glider, Edo-pontooned Stearman, Peel glider boat, Fokker F-14, Bowlus sailplane and primary glider, three Travel Airs, Model "F" Waco, Davis D-1, Keystone Commuter, Gipsy Moth, Fairchild KR-21, Fleet Trainer, Barling NB-3, Bellanca Pacemaker, Aeromarine Klemm, Fokker Super-Universal, General Aristocrat, New Standard Trainer, Ireland Privateer, Boeing 40-B-4, Stearman Jr. Speedmail, Sikorsky S 39, Vought-Corsair, Ryan Speedster, Kinner Bird, Great Lakes Sport Trainer, Ryan Brougham, Lockheed Sirius, Buhl low-wing, Savoia-Marchetti S-56 Gipsy Continental, Huntington Governor, Curtiss Robin Monocoupe 90, Eaglet glider, Engineers Sportster, Aeronca —M C.H

"Los Angeles" Still Strong

WASHINGTON (D. C.)—Study of sample parts of the Navy dirigible "Los Angeles" has shown that the airship is good for several years more service and need not be taken out of service in June, 1931, as was first feared

Eagle Firm to Offer Light Plane

KANSAS CITY (MO.) — American Eagle, states E E. Porterfield, Jr, president, will shortly offer a light airplane powered with a twin cylinder air-cooled engine of approximately 25 hp To be known as the "Eaglet," the craft will be a two-place monoplane. Tests on the initial model are expected within a few weeks

Soars 15 Hr. 13 Min., But Record Is Unofficial

SAN DIEGO (CALIF) — By soaring for 15 hr 13 min., Jack Barstow, glider pilot, recently achieved an unofficial world record for duration flights in engineless craft. The mark could not be regarded as official since he was not equipped with a barograph

Taking off on April 1 from Point Loma in a Bowlus Sailplane at 12 44 p.m., Barstow rode the air until approximately 3 57 a.m, many times flying out over the ocean and attaining an altitude of about 1,000 ft During the night he had only bonfires and auto headlights to serve as guideposts

The records Barstow exceeded unofficially were the official American record, made by W Hawley Bowlus, of 9 hr 5 min 32.4 sec., the official world mark of the German, Ray Schultz 14 hr 10 min, and the unofficial world record of 14 hr 45 min, made by another German, Lieutenant Dinert

Later on May 3, Barstow was badly injured when his glider crashed during an attempt to officially break the present world duration mark William Van Dusen the local N A A representative, was observing the flight, which had lasted about approximately eight hours before the accident occurred

Builds Kite Device For Radio Antenna

BOSTON (MASS)—Samuel F. Perkins of Dorchester, Mass, a well known man-carrying-kite expert is building some folding kites with which the United States Navy is to equip many of its planes for use in providing a radio antenna and a visible distress signal in case of a forced landing at sea He has already built some 700 of these kites and is expected to shortly receive a contract for 400 more These radio kites fold up like an umbrella into a roll 5 ft long If a plane is forced down offshore, the kite can be quickly unrolled and sent up attached to a 300-ft antenna carrying a distress signal

HIGH POINTS in the NEWS

▶ *Underway.* With nearly fifty planes and more than double that number of exhibitors, the New York Aircraft Salon opens at Madison Square Garden, May 3 and will run to the 11th.

▶ *Barographless record.* Jack Barstow, glider pilot, stays aloft 15 hr 13 min in a Sailplane near San Diego, but new world's record is unofficial since he carried no barograph

▶ *Powerless.* New York Glider Carnival is staged under auspices of Aeronautical Chamber of Commerce, National Glider Association, and a group of New Yorkers, at Bayside, L I Three cups to Atwater, two to Bowlus

▶ *N A C A honored.* Collier Trophy for 1929 awarded to National Advisory Committee for Aeronautics for its outstanding achievement—N.A.C.A cowling.

▶ *Materialistic.* American Society for Testing Materials prepares to listen to papers on aircraft materials at its annual meeting, Atlantic City, June 23-27

▶ *Not for landplanes* Outline plans for 2,700 mi. air cruise over Great Lakes and adjacent bodies of water Detroit Flying Club will sponsor the event, now scheduled for Aug 8-17

▶ *Farseeing* Fairchild K-6 aerial camera, operated by Capt Albert W Stevens, Air Corps, records view of Mount Ranier from 20,000-ft altitude above Crater Lake, 270 mi away, thus setting a record for long distance photography

▶ *Gas problem.* Motion is made in the House that entire problem of helium production be thoroughly investigated by a sub committee

▶ *Entries* N A A. and Navy Department approve 26 entries for the Annual Curtiss Marine Trophy Race, Anacostia, May 24

Airports and Airlines

▶ *By space and mile.* New rates announced for five air mail routes under the Watres Bill provisions are based on this arrangement instead of poundage payment

▶ *All set* Program completed for second annual National Airports Conference, Buffalo May 14-16

▶ *Better connections* Many hours cut from air travel routes to Southwest due to coordination of S.A F E and T A T -Maddux schedules at St Louis

A.S.T.M. to Discuss Materials for Aircraft

ATLANTIC CITY (N J)—In conjunction with the annual meeting of the American Society for Testing Materials to be held here June 23-27, there will be a discussion of materials used in airplane construction

This discussion will take the form of a symposium extending over two technical sessions of the meeting, the subjects being introduced in eighteen brief papers by representative authors, and intended to summarize the present knowledge concerning aircraft materials and elicit discussion from other contributors The formal papers are as follows

Ferrous Metals Used in Airplane Construction," by J B Johnson, Structural and Engineering Light Alloys for Aircraft," by R. L. Templin, "Structural and Engineering Ferrous Special Alloys," by Jerome Strauss, B H De Long, and J A Mathews, "Strength and Characteristics of Wood Used in Aircraft Construction," by G W Trayer, "Aeronautical Textiles," by W E Emley, "Corrosion-Prevention Methods as Applied to Aircraft Construction" by H S Rawdon, "Notes on Aircraft Finishes" by H A Gardner, "Applications of Stampings, Forgings, and Castings," by H. G Runde "Materials of Construction in Aircraft Engines," by R R Moore, "Failures in Aircraft Engine Parts and Causes Thereof," by T. T. Neill, "Development of Specifications and Materials Control," by H A Backus, "Mechanical Testing of Aircraft Materials," by J B Johnson, "Joining Aircraft Materials, Welding Brazing, Etc," by T W Downes "Procedure Control in Aircraft Welding," by H. L. Whittemore, "Magnetic Tests" by Sigfrid Specht, "X-ray Testing of Aircraft Materials," by Ancel St John, "Photo Elastic Studies of Aircraft Parts," by T H Frost "Heat Treatment, Process Control and Results Ferrous and Non-Ferrous," by H C Knerr.

Aero Committee Named

Plans for the symposium were developed and the papers secured by a committee made up of men well-known in the aircraft industry and familiar with its needs This committee, functioning under the chairmanship of H C Knerr consists of the following

H C Knerr, chairman consulting metallurgical engineer, Philadelphia, Pa. E P Warner Editor Aviation, McGraw Hill Publishing Co the G W Lewis National Advisory Committee for Aeronautics, Washington D C R D Weyerbacher, manager Naval Aircraft Factory U S Navy Yards Philadelphia, Pa J B Johnson, chief Material Section Air Corps, Wright Field Dayton Ohio Col Clarence M Young, chief Aeronautics Branch Department of Commerce H L Whittemore, chief engineering mechanics section, U S Bureau of Standards Washington D C H S Rawdon Senior Metallurgist, Bureau of Standards Washington D C Alexander Klemin (consulting engineer, Guggenheim Foundation School of Aeronautics New York University J S Newell Massachusetts Institute of Technology Harold Backus materials engineer, Berlinger-Joyce Co, Baltimore, Md , H C Richardson director of engineer, Great Lakes Aircraft Corp, Cleveland Ohio, T P Wright chief engineer, Curtiss Aeroplane & Motor Corp, Garden City, L I, N Y R. R. Moore metallurgist, Wright Aeronautical Corp, Paterson, N. J, R. S Archer, director of research Aluminum Company of America, Cleveland Ohio, J. A. Mathews vice president and metallurgist, Crucible Steel Company of America, New York City

Ohio Aviation Report For 1929 is Compiled

COLUMBUS (OHIO)—John M. Vorys, Director of Aeronautics in Ohio, has prepared a report of the activities of the Bureau of Aeronautics to the end of 1929 for Gov. Myers Y Cooper The Bureau was created on June 25, 1929, after passage of a bill which became the Ingalls Law

The information is issued in a 52 page booklet, the contents of which are listed as follows organization of the bureau, licensing of aircraft and pilots, air-marking, field work of the bureau of aeronautics, aeronautical information, airways and airports, aerial maps, aviation law, and conclusion

Under appendix comes the Ohio law creating the bureau, Ohio laws and regulations, air commerce and industry in the state, airports and landing fields, commercial aircraft operations an accidents in the state, aviation insurance, and aviation schools

A few of the more important statistics are herewith given Total number of airports and landing fields of all types, 101 miles of regular airways, 890, number of municipalities airmarked (an Ohio law requires such markers) 476; violations handled fourteen; number of miles covered by the director on bureau business, 8,054

Six manufacturers of aircraft in Ohio reported a production of 509 planes last year, ten firms manufactured products valued at $5,345,823 92, eleven concerns employed a total of 1,458 employees, payrolls for nine companies for the year aggregated $1,819,600 90, and nine corporations made expenditures totalling $1,795,815.25 for raw materials

It is stated capital invested in twelve plants devoted exclusively to aeronautical products amounts to $5,460,054 80, capital invested in 38 plants now used in part for aeronautical products, $7,010,220 00, value of land used for 101 airports and landing fields, and value of permanent buildings and improvements on them, $10,060,200 00, value of the 540 aircraft owned in Ohio (@$5,000 each), $2,700,000 Aviation salaries of $23,956,484 44 were paid out to factory employees Army Air Corps—military and civilian—personnel, commercial pilots, and airport and landing field forces

Operation Figures Given

An estimate covering the value of aviation products in Ohio puts the figure at $20,844,448 92

Reports from 70 Ohio airports add up to totals of 57,607 hr. flown and 4,320,600 mi. covered. The number of miles flown on scheduled transport routes was 1,597,036 in 15,497 hr. According to estimations reached, based on a state population of 6,826,000 persons, an average of one out of every 44 persons flew last year Miscellaneous flying done in Ohio during 1929 approximated 4,320 600 mi

In touching on the aviation gas tax question, director Vorys believes the present law, which allows plane operators a refund of the four-cent tax, should be altered as the present system involves so much "red tape" He advises either a more practical exemption scheme or thinks the proceeds of the tax should be kept and used in the preparation of state aerial highways

Test Sabbath Law at Baltimore

BALTIMORE (MD)—Charged with "commercializing the Sabbath," Lieut Lee Dice, operations manager of Curtiss-Wright Flying Service, Logan Field, J Wilbur Mallen, traffic manager at that airport, Edward Handler, president of Baltimore Airways, Inc. operating Handler Field and Warrington Moss, Jr., manager of the Green Spring Valley Airport, were arrested here for carrying passengers for hire on Sunday, May 4

Officials of Baltimore County issued a warning to the various airports that the Maryland Sabbath law would be enforced, but while the order was respected in several fields others operated seeking a test case

Aberdeen "Battle" Starts May 12

WASHINGTON (D C)—Night bombing "attacks" will be a feature of Army Air Corps and Coast Artillery operations at Aberdeen Proving Ground Md, for one week starting May 12 The Selfridge Field First Pursuit Group will join with the Coast Artillery anti aircraft corps in "defending" an airdrome and its plane force against the "enemy" In this case the "attacking" units will be composed of machines and men from the Second Bombardment Group Langley Field, Va, and the Third Attack Group Fort Crockett, Galveston, Tex Lieut Col Gerald C Brant Air Corps Mitchel Field and Maj Hugh J Knerr Commanding the Second Bombardment Group, will direct the maneuvers of the "home" and "opposing" forces respectively

Atwater, Bowlus Divide N. Y. Glider Meet Honors

BAYSIDE (L I N Y)—Sponsored by the Aeronautical Chamber, N G A., and a group of New Yorkers interested in gliding, the New York Glider Carnival was held here at the Queensboro Golf & Country Club May 1-2 The meet was managed by N. H. De Foe eastern representative of the National Glider Association, with Bennett H Horchler, starter, and R J Patterson, Jr, assistant.

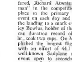
Winning three of the eight cups offered, Richard Atwater proved "high man" in the competition, taking first place in the primary glider duration event on each day and second place in the landing to a mark event W Hawley Bowlus, holder of the official American duration record of better than 9 hr, took two cups. On May 1, he accomplished the longest flight of the meet with an effort of 44.1 sec flying his well known Sailplane in the duration event open to secondary gliders and soarers. In the same event, May 2, he was also declared winner, his time being 34 17 sec on this occasion

Capt A Pippig of Germany, Lieut Ralph Barnaby, who dropped in a glider from the Navy dirigible "Los Angeles", and Mrs Betty Huyler Gillies, formerly with the Curtiss-Wright Flying Service were the others who won cups The landing to a mark, primary and secondary duration, and special women's event, respectively, were the contests won by the latter participants Captain Pippig took his event with a distance of 18.2 ft from the mark, while durations attained by Lieutenant Barnaby and Mrs Gillies were 33 35 sec and 22 07 sec., respectively

Automatic Release Employed

Among the gliders used were the Bowlus Sailplane, a soarer; Lieutenant Barnaby's German craft, a secondary glider obtained through the American Motorless Aviation Corp, a second A M A C secondary glider, and several primary trainers such as the Cessna and German Kegel craft. Shock cord used was furnished by R E. Dowd, of the Russell Manufacturing Co Mr Dowd participated as one of the judges

Use of the A.M A C. Automatic Glider Release, of the type developed by Mr Dowd and manufactured by the Russell firm, proved of interest, the device working handily throughout the meet This apparatus consists of a wooden box carrying a piston and cylinder bound together with Rusco Aero Rings of a standard elasticity. The box assembly is staked securely to the ground, while a cord connects the piston and the tail of the glider A cover, sliding in a groove of the box, may be set for any desired pressure determining the time at which the glider will be released when pulled by the usual shock-cord methods from the nose. Thus an auto may carry the regular nose shock cord at a steady speed of say 10 m p h the glider is released by the box device automatically. The Russell concern's price for the release unit, staking cord etc, is $35, with discounts available for clubs, manufacturers, etc



W Hawley Bowlus in the flight which won him the cup for duration on the first day of the Carnival

The trophies awarded were donated by C. T. Stork, *Popular Science Monthly*, the National Glider Association, and the Long Island Chamber of Commerce. The managing committee of the meet was headed by C T Stork and included Capt Frank Hawks, Prof Alexander Klemin, Amelia Earhart, Lieutenant Barnaby, Rodman Wanamaker, 3rd, and Edward P Warner.

Officials See P. & W. Oil Engine

WASHINGTON (D C.)—A Boeing military plane equipped with the recently announced Pratt & Whitney Wasp engine adapted for the burning of fuel oil has been demonstrated here before Army and Navy officials [The carburetion system is replaced by fuel injectors and pumps for each cylinder The resulting power plant is not a Diesel, as explained in our description (AVIATION April 19, p 815), because the spark ignition system is retained whereas the Diesel engine operates by compression —Ed]

McKee Trophy to Capt. W. R. May

OTTAWA (CAN)—Capt W. R. May of Commercial Airways, Ltd, has been awarded the 1929 McKee Trophy given annually to the flier "who renders the most meritorious service to the advancement of aviation in Canada." Captain May opened up the Mackenzie Valley air mail run, a 2 000-mi airway between Fort McMurray and the Arctic He employed Bellanca planes

Air Corps Budget Bill Now Ready for Senate

WASHINGTON (D C)—After having been subjected to several months' delay in the Senate, the War Department appropriation bill, containing provisions for the carrying out of the 5-yr program of the Air Corps has been released by the Appropriations Committee and is expected to come up on the floor for immediate consideration

Although changes were made by the Senate committee in some of the sections of the bill, the part dealing with the activities of the Air Corps was left in the same shape as it was when passed by the House The general appropriation planned for the next fiscal year is $3 692 881

In discussing the work of the Air Corps before the Senate committee Assistant Secretary of War Trubee Davison stated that sufficient provision is made for the procurement of planes but that the amount authorized for technical construction is inadequate

He explained that technical construction is concerned with providing landing fields, hangars, and parachute huts as contrasted with the construction of barracks and living quarters He also pointed out that the program is not balanced in that authorization is contained for more flying personnel than flying equipment

Buy More Planes

Secretary Davison stated, however, that the War Department has been able to purchase more planes during the present fiscal year than it had anticipated due to the fact that prices have dropped

Questioned by Senator Bingham as to the superiority of British planes in quick-climbing, he replied that the same conditions do not have to be met in this country He explained that in the defense of London the British cannot expect more than a 20 min notice of an attack so they are compelled to have available fast climbing planes It is not conceivable that any air attack could be made on an American city or the Panama Canal with such a brief notice, he said adding that fast climbing ability can only be obtained at the expense of horizontal speed and that American aircraft are therefore superior in general fighting ability

Name Graf's Liaison Officer

NEW YORK (N Y)—To care for communications between the Graf Zeppelin and the naval base at Lakehurst, N J during the forthcoming flight of the German dirigible from Europe to South America and the United States, Capt Harry E Shoemaker U S N has been named liaison officer on the flight. Captain Shoemaker sailed for Europe May 5 on the "American Trader" The Graf Zeppelin's call is "DENNE" Radio equipment for both high and intermediate frequencies is carried

Air Photo Distance Record Now 270 Mi.

WASHINGTON (D. C.)—A new aerial photography distance record has been established, bettering by almost 50 mi. the previous record made last year when objects 227 mi. from the eye of the camera were successfully registered on film in a single exposure. Capt. A. W. Stevens, Air Corps photographic expert, established the new mark as well as the old. Two hundred and seventy miles is the distance just attained.

The camera used by the Captain is the Fairchild Model K-6 designed for long range work at high altitudes. It is worth more than two thousand dollars.

The 270-mi. photograph taken by Captain Stevens was made while in flight 20,000 ft. above Crater Lake, Ore., and gives a remarkably clear picture of the various mountain ranges stretching northward to the lofty peak of Mt. Ranier, 14,000 ft. above sea level. Crescent Lake and Diamond Peak appear in the foreground, then follow the Three Sisters, 125 mi. away, next Mt. Jefferson, 175 mi. away, then Mt. Hood, 200 mi. distant, and finally, in lone majesty on the edge of the horizon, Mt. Ranier. Captain Stevens took the picture from an Army plane piloted by Lieut. John Corkille.

Explains How It is Done

"Shooting at Mt. Ranier from a distance greater than that between New York City and Washington is much like shooting at the moon with the difference that you can see the moon," states Captain Stevens. "The principal task is to aim the camera in the general direction you believe your objective to be, snap the trigger, and hope for luck.

"While I am very well satisfied with the results obtained on this particular mission, I am inclined to believe that it will only be a matter of time before we will develop a camera that will record even greater distances. Before we can use it, however, we must have a photographic plane that will take us considerably higher than 20,000 ft. because from that altitude even an object as tall as Mt. Ranier will sink below the horizon at 300 mi."

The lens, which was especially perfected by Captain Stevens for long distance work, is of a peculiar red—so deep in shade that, to the naked eye, the lens seems black. This unusual shade is really a light filter which enables the camera to venture into distances which no ordinary lens can register. A highly sensitive film is also used.

Terra Haute Firm Opens Branch

TERRE HAUTE (IND.)—John S. Cox & Son, dealer in aeronautical and automotive supplies, announces the opening of a parts and supply store at the municipal airport, Dresser Field, to supplement its main business headquarters at 222-24-26 South Seventh St.

Captain Stevens with the Fairchild K-6 camera used in photographing Mount Ranier

Arrange R-100 Welcome

MONTREAL (QUE.)—Arrangements are being made by various officials and organizations for the welcome of the R-100, scheduled to land at St. Hubert Airport sometime late this month. The program being planned for that occasion is a most extensive one and will endeavor to show the air-mindedness of the citizens in this district. His Worship, Mayor Houde, is aiding in the selection of committees for the event.

Detroit Realized $9,242 From All-American Show

DETROIT (MICH.)—The City of Detroit took in a total revenue of $9,242 during the Third All-American Aircraft Show, according to figures just released by William J. Wallace, engineer-manager of the Municipal Airport.

Seventy-five hundred dollars of this amount, Mr. Wallace said, came from the Detroit Board of Commerce as rental on the huge hangar. A profit of $1,205 was made on 12,053 gal. of gasoline and $94 was realized on 188 gal. of oil. Commission on sight-seeing activities on the airport during the show amounted to $443. Sight-seeing operators took in $8,860, carrying a total of 2,218 pay passengers during the eight show days.

Between twenty and twenty-five planes are now being regularly housed in the large hangar. The 107th Observation Squadron, of the Michigan National Guard has taken complete possession of the smaller hangar and will remain there until the middle of June when a new $100,000 hangar will have been completed for them on Wayne County's new 640-acre airport at Goddard and Middlebelt Roads.

Announce 26 Entries For Curtiss Race, May 25

WASHINGTON (D. C.)—The N.A.A. and Navy Department have approved 26 entries for the annual Curtiss Marine Trophy race to be held at Anacostia, D. C., May 24. Lieut. W. G. Tomlinson, of the Navy, winner last year at an average speed of 162.5 m.p.h. flying a Wasp-powered Curtiss Hawk, is again entered. The list is as follows:

Fighting Planes
F 6 C-4 Storrs, A. P., Lieut., U. S. N., Anacostia
F 7 C-1 Dillon, W. N., Lieut., U. S. N., Bureau of Aero
F 6 C-3, Page, A. H., Captain, U. S. M. C., Marines
F 6 C-4 Flagg, A. P., Lieut., U. S. N., battle fleet
F 6 C-4 Tomlinson, W. G. Lieut., U. S. N., battle fleet.
F 6 C-4 Leach, W. D., Jr. Lieut. (jg) U. S. N., battle fleet.
F 6 C-4 Orrall, B. W. A. M. M. 1c, U. S. N., battle fleet.
Observation Planes
O 2 U Lynch, J. B., Lieut. U. S. N. R., Bureau of Aero
O 2 U Kiefer, D. Lieut., U. S. N., battle fleet.
O 2 U Dyer, J. E. Lieut., U. S. N., battle fleet
O 2 U Kernodle, M. H., Lieut., U. S. N., scouting fleet.
O 2 U Champion, C. C. Lieut., U. S. N. scouting fleet.
Torpedo and Bombing Planes
T 4 M De Long, E. R. Lieut. U. S. N., battle fleet.
T 4 M, Beck, J. E. Lieut., U. S. N., battle fleet.
T 4 M Taylor, H. W., Jr., Lieut., U. S. N., scouting fleet.
T G Seligman, M. T., Lieut. U. S. N., Bureau of Aero.
T 4 M Bolger, J. F., Lieut. U. S., scouting fleet.
Amphibians
O L 8, Burdick, W. E. Ens. U. S. N. R., battle fleet
O L 8, Haeberle, G. C., Lieut. U. S. N., battle fleet
O L 8, Guinn, T. D. Lieut. U. S. N. Hampton Roads
O L 8, Kane, J. L., Lieut. (jg) U. S. N., Naval Academy
O L 8, Ketchum, D. Lieut. U. S. N. scouting fleet
Training Planes
N 2 C, Hardison, O. B., Lieut. Commander, U. S. N. Bureau of Aero
N Y Short, G. E. Lieut., U. S. N., Hampton Roads
N Y Nichol, B. B., Lieut. (jg) U. S. N., Hampton Roads
N Y Manly, W. G., First Lieut. U. S. M. C., Hampton Roads.

Change Balloon Race Plans

CLEVELAND (OHIO)—The date and place of the National Elimination Balloon Race has been changed and it will now be held at Houston, Tex., on June 10, according to W. G. Rose who will manage the Gordon Bennett International Balloon Race leaving Cleveland, Sept. 1.

Standard Oil Orders Stearmans

WICHITA (KAN.)—Standard Oil Company of California has ordered three Stearman Junior mail planes, powered by 400 hp. Wasp engines.

Georgia Guggenheim School Head Announced

HOLYOKE (MASS.)—Montgomery Knight, this city, for several years in charge of the N.A.C.A. research department, Langley Field, is to have charge of the Guggenheim aeronautical engineering school being established at Georgia School of Technology. Mr. Knight, a graduate of M.I.T., later specialized in aeronautical research at Harvard and Johns Hopkins University, Baltimore, Md.

At one time he conducted fog dispersing experiments for the government at Aberdeen, Md. The Guggenheim Fund is providing $300,000 for the formation of the Georgia aero school bringing the total of its grants to schools and colleges to approximately $1,500,000, excluding the amount used in organizing the Daniel Guggenheim School of Aeronautics at New York University. A Committee of Trustees appointed by Ambassador Harry F. Guggenheim selected the Georgia center of learning for the award after judging proposals from 27 colleges and universities in the South.

Issue Building Plans

Plans have been completed for a three-story building at the Georgia School of Technology to house the Guggenheim school.

The building, which will cost approximately $100,000, and which will contain another $100,000 worth of equipment, will be 95 ft. by 74 ft., three stories in height, and of English Collegiate architecture to harmonize with other buildings on the campus.

On the first floor will be a main corridor, with a lecture room on one side and a museum on the other. Beyond these two rooms is to be a cross corridor with an exit at each end of the building, and beyond the cross corridor the wind tunnel room—a hall measuring 40 ft. x 80 ft. and 20 ft. in height.

On the second floor, just above the wind tunnel will be the balance room, measuring 30 ft. x 39 ft., while in the front portion of this floor will be four class-rooms and other special rooms and offices.

Construction to Start in June

The third floor will be the location of the drafting room, with a large skylight 20 ft. x 40 ft., together with a library and conference rooms. In the basement will be located additional testing, power, and store rooms, drawings reveal.

The building, which was designed by Prof. Harold Bush-Brown head of the department of architecture at Georgia Tech and Professor Gailey, of the same department, in co-operation with members of the aviation department faculty will be of fireproof reinforced concrete and brick construction. Work on the building will start early in June it is stated.

Davis D-1-66 Approved

WASHINGTON (D. C.)—Approved type certificate No. 317 has been awarded the Davis Aircraft Corp. for its two-place, open cockpit, monoplane D-1-66 with the following specifications: engine, LeBlond 66, weight empty, 854 lb., useful load, 526 lb., gross weight 1,380 lb.

Ford 5-AT in Orient Attracts Great Interest

DETROIT (MICH.)—Widespread interest has been aroused in Japan over a model 5-AT Ford monoplane now being demonstrated in the Orient by Perry G. Hutton, Wichita (Kan.) pilot, according to a cablegram received here by William B. Mayo, chief engineer, Ford Motor Co. More than 500 persons were carried on flights over Tokyo during the first few days of the demonstration, Hutton reported.

The plane powered by three Pratt & Whitney Wasps, is the first tri-engined Ford to be seen in the Orient. It was shipped from San Francisco, February 15. James H. Bear, special representative of the Ford firm and Andrew Kristian, mechanic, are also accompanying the Ford on its tour.

Following re-assembly in Tokyo, special flight permits were obtained before the trip was started. The plane will be flown for several months around Tokyo, Yokohama, and other Japanese cities, and will then proceed across the Sea of Japan. Flights will be continued at Mukden, Manchuria, Shanghai, Tientsin, and other Chinese cities.

Russell Opens Kansas City Base

KANSAS CITY (KAN.)—Russell Parachute Co., San Diego, Cal., is opening a supply and service base at Fairfax Airport here with G. J. Duncan in charge of operations.

Second Michigan Tour Planned for July 19-26

PONTIAC (MICH.)—It is expected 75 planes will enter the Second Michigan Air Tour, the dates for which have been tentatively set as July 19-26 by the Pontiac Board of Commerce. Extending into the Upper Peninsula, the itinerary will cover between 1,500 and 2,000 mi.

A feature of the tour will be the opportunity offered dealers to display and demonstrate planes at stops. Only the larger cities, offering ample accommodations for the many machines, will be visited, and with but two stops a day scheduled, it is planned to provide a lineup of the aircraft for public inspection at each airport. Every effort will be made to co-operate with the distributors participating in the tour to get their planes before the public.

Last year 44 planes flew on a five-day tour visiting 30 cities, but bad weather disrupted the schedule.

Board of Commerce Is Sponsor

Sponsorship of the tour has been assumed by the Board of Commerce, which last year acted jointly with the city. G. Donald Kennedy, manager of the Pontiac Municipal Airport, will again be director, and Wayne J. Sheldon, Detroit, will act as referee.

Sheldon B. Steers, assistant state director of aeronautics, Lansing, will be flight commander. Floyd Blakeslee will be chairman of the Board of Commerce air committee in charge of the event.

The route has been outlined as follows: Ann Arbor-Ypsilanti, Jackson, Battle Creek, Kalamazoo, Muskegon, Grand Rapids (two-day stop for Grand Rapids Air Fair), Cadillac, Emmet County Airport, Upper Peninsula-Blaney, Sault Ste. Marie, and St. Ignace or Mackinaw Island, Saginaw, Bay City, Flint, Lansing, Detroit, and Pontiac, Mich.

"QUOTES"

"Archie" Waxes More Bold. "Despite advances in aviation, the aeroplane as a military weapon has changed but little since the World War, while in the last five years every element of anti-aircraft defense has been newly designed and now meets the aeroplane on better than equal terms."—LIEUT. COL. WILLIAM M. BOWEN, instructor, anti-aircraft regiments.

Finds Us in Fore. "In general, our progress in aviation—naval, military, commercial and civil—compares favorably with that in England and France. While the Schneider races have given the nations taking part an edge in certain types of experimental high speed planes and motors, the United States is unexcelled in all types in actual service and in production. Our air mail has nothing that surpasses it in Europe, especially in night flying."—REAR ADMIRAL MOFFETT, Chief Bureau of Aeronautics, Navy Department.

A la Ponce de Leon. "I have found the 'Fountain of Youth' in air travel."—W. H. GANNETT, retired millionaire publisher.

Not So Enthusiastic. "There is no question but that glider flying will give one the 'feel' of a ship in the air and that much can be learned from them. There is a demand, however, for a small plane with a motor and I do not believe such a type ever will be supplanted. Gliders will not prove satisfactory where it is only possible, as in so much of the United States, to get them into the air by towing behind motor cars, or by similar launching methods."—E. E. PORTERFIELD, JR., American Eagle Aircraft Corp.

AERONAUTICAL FINANCE

By R. R. Doane

Statistical Summary

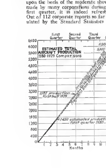
Weekly Comparisons

	Week Ended May 2	Previous Week	Same Week 1929
Aviation			
Aviation stock averages	29 87	29 09	53 61
Number of stocks traded in (1)	49	45	69
Volume aviation share sales (2)	839,300	780 500	1 092,600
Ratio aviation share sales to total sales (3)	2 38	3 58	4 91
General Market Data:			
Total volume share sales N Y Stock & Curb Exchanges	35 105 920	21 800 900	27 192 330
Railroad share sales N Y S E	446 600	428 740	1 001 440
Market averages (*N Y Times*)	242 45	239 99	249 12
New Domestic Financing	$119,527 000	$52,374 000	$51 533,000
Financial (000 omitted) (4)			
Reserve credit extended	992 225	1 004 963	1 329 245
Broker a loans	4 274 000	4 217 000	5 532,000
Bank exchanges N Y C. H	7 352,075	6 741 652	7 250 930
Investment reporting banks	5,791 000	5 747 000	5 971 000
Loans on securities R M Banks	8 326,000	8 238 000	7 316 000
All other loans R. M. Banks	8 629,000	8,607 000	9 066,000

Notes—(1) All stocks actively traded in on both New York Stock Exchange and the Curb Exchange; also contains over-the-counter stocks on which bid and ask quotations are regularly published (2) Total volume both N Y Stock and Curb Exchanges (3) Percentage of aviation stock trading to total volume of sales all classes of stocks on both exchanges (4) Weekly Reporting Member Banks, Federal Reserve System

Staking its reputation on a forecast that improvement in the general volume of business over the country will, from now on, show more than the normal seasonal advance, the Harvard Economic Society specifically says "the business improvement that appeared during March was of about seasonal proportions In April, activity appears to be still expanding, and along with this increase in the volume of business has come greater strength in commodity prices During the quarter now begun, we expect prices to improve further and activity to show a more than seasonal increase over the first quarter."

Coming, as this statement does, fresh upon the heels of the moderate showing made by many corporations during the first quarter, it is indeed refreshing Out of 112 corporate reports so far tabulated by the Standard Statistics Co,



quarterly earnings show a decline of 16 6 per cent under a year ago Out of this group the automobile part and accessory companies suffered a 47 5 per cent decline in net earnings, the oils 36 per cent, the retail trade companies 10 4 per cent, railroad companies reveal a 20 7 per cent reduction, while the railroad equipment companies, on the other hand, did 79 2 per cent better than during the same quarter one year ago

When compared with this showing of general industrial recession all available indices of aviation's activity present an optimistic picture Total aircraft production, in spite of a heavy carry-over, has been maintained on an average very nearly approximating that of 1929, while advances in its supplementary fields disclose marked improvement In this connection the following comparative tabulation cannot help but prove enlightening:

Aviation Activity	First Quarter 1930	Same Quarter 1929
Number of Licensed and Identified Planes	9,679	6,164
Number of Pilot Licenses Valid	11,431	5 731
Ratio Pilots to Planes	1 181	924
Excess Pilots over total number of Planes	1,753	None
Excess Planes over total number of Pilots	None	433
Increase in Pilot Licenses	1 144	401
New Licenses applied for	2,243	891
New Student Permits Granted	3,672	249
New Licensed and Identified Planes	*1 544	1 058
Mail plane miles scheduled daily	50 433	39,216
Total Lbs. Mail carried	1 075,311	923 000

*For two months only.

By its very nature aviation is a highly specialized industry, and as such is not, at this stage of its development, as sensitive to the swings of general business conditions as many have supposed From a quantitative standpoint as the volume of its production increases from year to year it may be confidently expected to display a far more definite reaction to the rythm of general trade than at present This does not mean that as an industry it is "depression-proof," but it does imply that its product being inevitably bound up with that of commercial transportation has not yet grown to the proportions in point of volume whereby a business recession would, or could, materially effect the total volume of orders for new equipment from this source Government requirements and normal replacement can be expected to proceed at the same pace quite regardless of the business cycle It is only in the field of new uses and new users that a problem exists and the time period of adjustments in this demand is usually brief in duration.

In comparing this industry's behavior with the general trade recession years of 1924 and 1927 we find very little if any, correlation in results As a matter of fact over the entire period of its history the aircraft industry has been able to demonstrate statistically at least, a relative independence from the general state and trend of business Even the violent reaction of the latter part of 1929 did not shake it from its normal longrange rate of growth There appears to be considerable justification in assuming that at this stage of the industry's experience technological advances coupled with intelligently planned promotional programs are far more apt to be the major conditioning factors affecting aviation's rate of expansion than are outside business conditions.

The aviation stock averages remain substantially at the same level as one week ago, and are apparently awaiting the late spring and early summer developments—the pivotal period in the aviation financial year

With the industry's promotional program now getting fairly under way the marked improvement in the quality of favorable publicity the passage of encouraging legislation increased public patronage and appreciation of the air mail and general air transportation the growing surplus of trained pilots over total number of available planes the marked increase in student permits granted the ground seems to be unusually well prepared for a substantial showing during the second and third quarters of this year

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N.A.T. Net Profits Up

For the first quarter of 1930 National Air Transport reports net profits of $127,268 00 as against $120 626 00 for the same period one year ago This is the equivalent of 19 cents per share vs 18 cents in 1929

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Air Investors' Assets Up

Air Investors, Inc, holding securities of eighteen representative aviation and allied enterprises, shows a liquid asset

value equivalent to $35 a share on its 81,263 shares of convertible preference stock, currently quoted at $20 This is an increase from $24 40 as of December 31, a growth of 43 5 per cent This valuation includes only cash plus listed securities at market value as of April 14, stated Harvey L Williams, president of the company.

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Stinson Aircraft Earnings

Stinson Aircraft reports net earnings per share at 11 cents for the eleven month period ended November 30 1929

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A.C. Reduces Stock

WILMINGTON (DEL.)—A reduction from 10,000,000 to 5,000,000 shares in capital stock was decided upon at the annual meeting of The Aviation Corp held here on April 29 The board of directors now includes the names of Dennis J Walsh, Jr and Richard H M Robinson, while those who resigned from the board were John C Grier Jr John L Lancaster and J S Pyeatt

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Truscon Earnings $130,905.16

YOUNGSTOWN (OHIO)—Net earnings of $130 905.16 for the first quarter of 1930 have been announced by the Truscon Steel Co, manufacturers of equipment for aeronautical buildings This compares with $201,411 17 for the first quarter of 1929 and $90,275 40 for the same period of 1928 The regular quarterly cash dividend of 3 per cent on common stock and 1½ per cent on preferred were paid in the first quarter of this year In addition, a 6 per cent stock dividend on the common was distributed March 6 to stockholders of record January 6 1930

Navy Opens Bids for P. & W. Parts

WASHINGTON (D C.)—Bids on parts for Pratt & Whitney engines were opened by the Navy Department, May 6 1930 For type R 1690 engines, 25 1765-0 exhaust valve guides, 010 oversize, O D , and 25 1420-0 intake valve guides, 010 oversize, O.D are called for For type R-1340 engines the bid calls for 50 2844-0 intake valve guides, 010 oversize, O D , and 50 1050 0 exhaust valve guides, 010 oversize, O D These supplies, as may be ordered during the period ending June 30 1930, are to be delivered to the Naval Aircraft Factory, Philadelphia

Tagliabue Firm to Move

BROOKLYN (N Y)—C. J Tagliabue Manufacturing Co, this city producer of airplane altimeters and other instruments, will move about July 1 to a new five-story building on Park Avenue extending from Nostrand Avenue to Sanford Street providing approximately 300 000 sq ft of working space

St. Paul Promotes Goodwill Tour

ST PAUL (MINN.)—Invitations have been sent by Governor Theodore Christianson, of Minnesota, and St Paul city officials to Canadian officials and the Winnipeg Flying Club to participate in the International Goodwill Flight Tour, starting from Winnipeg May 16 The tour, which is being held under the auspices of the St Paul Aviation Club, will touch at St. Paul and other Minnesota cities

Boston Firm Appointed Aviation Insurance Agent

BOSTON (MASS)—All types of aviation insurance are to be handled by Bott, Dalton & Church, an insurance firm located at 40 Kilby St this city, following its appointment as general agent for Aero Indemnity Co and the Aero Insurance Co of New York, underwritten and operated by Barber & Baldwin, Inc

The Boston firm will offer among other facilities policies on the part-payment plan and assistance in purchasing a plane by deferred payments Daniel W Wormwood will head the aero insurance department

One form of coverage that is now available, states the company, is a blanket accident policy for protection of every student in an aviation school

Somewhat similar to this coverage is the personal accident policy issued by Bott, Dalton & Church to any one desiring to be protected while flying either on an established transport line or elsewhere in licensed planes with experienced pilots This form of coverage can be obtained for any duration of time desired, and considering the broad form of policy issued, at a very low premium.

Ohio Firm Buys Tool Company

COLUMBUS (OHIO) — International Derrick and Equipment Co, maker of Ideco airway beacons has purchased the Leidecker Tool Co, of Marietta, Ohio states Harry M Runkle, president of the former concern According to Mr Runkle, the plant of the Leidecker firm, manufacturer of drilling and fishing tools, will remain in Marietta, the chief change being utilization of the sales and distribution resources of the International Derrick firm Steel hangars, floodlight towers, airport and airways equipment are also produced by the International Derrick and Equipment Co

Aikman Makes F-32 Carpet

NEW YORK (N Y)—Collins & Aikman Corp, this city, has manufactured a special lightweight carpet for installation in the Fokker F-32 built for L P Fisher, president of Cadillac The covering weighing only 35 oz per square yard, is so made that it can be placed into position without any sewing whatever the carpet making its own selvage wherever cut.

To Emphasize Safety At Pacific Coast Show

OAKLAND (CALIF.)—Setting for itself the definite task of "Selling Safety," the first annual Pacific Coast Aeronautical Exposition, which will serve the Northern California area from the Oakland Municipal Airport for a nine day period beginning June 28, promises to be the first of the major air shows of the country to serve a purpose other than the worthwhile objectives of an industrial display

According to W P Butler, managing director, the Pacific Coast event will be so planned as to constitute a powerful "course in confidence" for the big attendance which is confidently expected Officials of the exposition point out that no effort will be made to force the idea of safety on the Northern California public but rather that every possible subtlety will be utilized to impress the message not only upon the anticipated crowd of 100,000 paid admissions, but upon millions of others through the medium of radio broadcasting

Free lectures with accompanying demonstrations, will provide one of the steps in what is described as a veritable cöoperative campaign to develop and further public confidence in modern flight Exhibitors will be permitted to cöoperate in these addresses, using their own demonstrating equipment

Won't Permit Dangerous Flying

Among the firms already signifying participation in this plan are the Boeing School of Aeronautics, the Goodyear Tire & Rubber Co., the Standard Oil Company of California the Aeronautical Engineering Co, Pacific Aeromotive Corp Motor Aviation Industries, Inc Curtiss-Wright, and others. The Department of Commerce, officials of the Oakland Municipal Airport, and the University of California, also plan to take part.

In keeping with the idea of safety no dangerous stunting will be permitted in connection with the exposition although certain types of unusual flying will be permitted in the demonstration of planes and parachute drops will be allowed

Leading executives of firms prominent in aeronautics in the San Francisco Bay region have expressed themselves as considering the Pacific Coast Aeronautical Exposition "a real common-sense effort toward the promotion of aviation"

Develops New Airwheel Brake

AKRON (OHIO)—Perfection of a dependable and simplified brake for use with Airwheels has been announced by the Goodyear Tire & Rubber Co Although the Airwheel fits directly to the hub, thereby reducing the brake surface circumference, the actual brake surface is increased as a result of the greater hup length and the fact that the brake runs practically the entire length of the hub,

Aero Speeches Made At U. S. Chamber Meeting

WASHINGTON (D C)—Among the aeronautical speakers at the Chamber of Commerce of the United States 18th Annual Meeting, were Lieut Comdr C G McCord, U S Naval Aircraft Factory, Phila, W Irving Bullard, chairman, U S Chamber Committee on Aeronautics, Frank H. Russell, vice-president of the Aeronautical Chamber of Commerce, and Gen John F. O'Ryan, president of Colonial Airways system

"How Can the Aeronautics Industry Cooperate With the Insurance Carriers In the Reduction of Losses?" was the subject taken by Lieutenant Commander McCord. He listed fire, engine failure, flying, collision, overloading, and fog or thick weather as the main hazards aviation has to contend with at this time.

"We are in crying need of improved methods of fire prevention and extinguishing, and our concern in the matter is giving rise to extensive study of the subject In this matter, as in the case of many of the accessories applied to aircraft, commercial manufacturers are held back in development work by the limited market They realize that the returns from sales in the present state of the industry will not cover the costs of research

Engines Much Better, But—

"Engine development is progressing, and with it development of suitable fuels, but our comparative standards must advance progressively.

"One operating company claims a period of 700 hr between complete engine overhauls as compared to a scant 100 hr which we considered necessary ten years ago. This 700 hr means about seventy thousand miles of engine operation at three-quarters to nine-tenths of full throttle operation

"When you compare this with your relatively heavy automobile engine, operating at an average of around twenty per cent of its full power, you will realize that these aircraft engines are good, yet they are not good enough We need more reliability and we should not have to go out of this country to secure it, as we have done in the case of the power plants for the new airships being constructed for the Navy in Akron

Hazards and Their Control

"The operator cannot afford to use second rate engines and such have no place on the market It is unfortunate at this stage of development that more aircraft are not being sold, for nothing spurs lagging development as keen competition does At present there is almost a monopoly on certain engine accessories, notably carburetors and magnetos

"Development of reliable solid fuel injection systems and firing by compression ignition would automatically dispense with those items and adoption of diesel engines or those operating on a similar cycle using heavy oil would appear to be one of the most important items to foster for the attention of those whose interest lies in safety We want better fuel economy and more reliability in aircraft engines.

"Of the items of hazard I have listed, those easiest for the industry to control—which involve nothing along scientific research—are bad landing fields, overloading on planes, and disregard of weather conditions

"Local government working with the transport companies will take care of the field question in time The overloading and the disregard of weather information is within the control of the transport people and safety, after all, boils down to the use of brains and taking advantages of the facilities that you have.

"Responsibility for material failures may be split up between the designers, builders, and maintenance crews, but where the executives can aid most in reducing aircraft risks, is in upholding high American standards of business ethics and in not trying to squeeze too much out of an infant industry" he said

Be content to take a loss for a while longer in order that the research men and designers may produce the quality and reliability without which quantity production means nothing"

In his speech on "Aviation as a Business" Mr. Bullard said

"It is while that industry is still plastic and still young in its growth that it most needs and can best profit by the very best human superintendence beginning with the financial and going on to the physical. It needs the very best personnel and morale alike among its bankers its executives its pilots its ground forces its publicity men

What Are The Answers?

"For example to cite but a few pertinent questions how far in this merger age should the trend already visible among some smaller units now proceed further among air lines? What can be done most effectively to reduce costs and expand revenues? Can plane costs themselves be substantially lessened in time? Likewise fuel costs as hinted in claims for diesel engine performance? Through cooperative use of ground forces and other staffs? Can progress be made further in rate adjustments in insurance advertising etc.?

Considering "What's Ahead for Air Transportation" Frank H. Russell gave a resume of its past development and the part the government played in keeping it alive during certain crucial periods

He made mention of the fact that railroads are realizing the value of cooperating in air travel routes, the proposition meaning more business all the way around

"The cost of air travel will approach that of the railroads through quantity production of its equipment, cheaper fuel, and more than anything else the spreading of the cost of the ground organization over an ever increasing traffic Only four years ago an air mail operator took a contract at a rate of $1.50 per pound from Chicago to the coast It was freely predicted that he would go broke. The other day he bought out his competitor!"

General O'Ryan declared that present activities in aviation are dependent upon the promise of the future, and that future be continued, is unsafe if it is dependent on the Watres bill or any other form of government aid Any kind of aviation subsidy he believes unstable and unsound

He believes a new era will come with the advent of a dependable comfortable craft seating 35-40 persons. The ratio of the number of passengers to the size of crew in the present machines is so close that it is practically impossible to fly them at profit he stated. When in a yearly average only 50 per cent of the seating capacity of a fourteen place plane is taken by passengers and that plane carries a crew of three or four men, the margin is too small

A passenger pay rate commensurate with the amount of time saved over other forms of transportation was advocated by the speaker In his experience, he said, he found that people did not object to paying $.087 per mile. On the New York-Boston run of Colonial 285 paid passengers were carried during January, 707 in February, and 1218 in March, according to figures presented.

All the speakers with the exception of General O'Ryan praised the Watres air mail bill as giving the passenger operator a chance to break even or to make a profit, depending on the amount of capability shown in management

May Be Flown in Pacific Attempt

AN ENDEAVOR to better the German non-refueling endurance record of 65 hr 20 min soon will be made in this special new "flying wing" Junior Wasp Emsco just completed at Los Angeles Thereupon, if results warrant, the craft will be crated and shipped to Tokio Japan, from where Charles F. Rocheville, vice-president of the Emsco Aircraft Corp, plans to fly the plane nonstop to America—a trip of some 4,955 mi Seattle, it is said, will be the goal of the flight

Mr Rocheville, who designed the machine, took the craft for a test flight on April 17, the initial trial being termed successful. In dimensions, the plane has an overall length of 36 ft, and a wing span of 60 ft. The landing gear is comprised of three wheels in triangle formation below the wing Speeds are estimated from 125 to 145 m.p.h, and it is expected that the craft can remain in the air for 70 hr

A unique feature of the plane is the double cowling of the engine, which is enclosed on an N A C A cowl while in addition the fuselage is open in the rear of the engine, permitting air to flow back through the fuselage between the outer fairing and the two inner cockpits thus giving maximum engine cooling The flow of air through the fuselage is promoted by a large outlet opening at the rear tip A feature which has been shrouded in considerable secrecy is a high lift device involving an air scoop beneath the fuselage with venturi slit outlets extending along the length of each wing panel on the upper side of the air foil in rear of each spar By this method it is hoped to greatly increase the plane's available lift at the time of take off

The plane has been dubbed the "Emsco Asbestos"

Either Theodore S Lundgren pilot and navigator or W. L. Seiler, former Navy flier will accompany Rocheville on the endurance flight attempt One of these men furthermore will be selected to fly with Rocheville on the trans Pacific attempt.

New York Youth Makes Record

GLENDALE (CALIF)—When Frank Goldsborough, a 19-year-old Jackson Heights (N Y) youth landed in a Kinner powered Fleet at the Grand Central Air Terminal, 12 40 p m Pacific Standard Time, May 4, he had reduced the former junior trans-continental record from 48 hr flying time (made by Richard James, New York), to 34 hr 3 min. He left the Westfield (N J) Airport on April 28, 7 40 a.m, and made the journey in easy stages Bad weather, however, delayed the youth several times Though his plane was slightly damaged while taking to the air near El Paso, Tex, it was landed safely at his next stopping point, where repairs were made Goldsborough, who holds a private license, is the son of the late Bryce Goldsborough, lost in the ill-fated flight of the "Dawn."

Re-Name Arrow "Tangerine"

LINCOLN (NEB)—Formerly known as the "Tangerine" [AVIATION, Mar 29, p 654], Arrow Aircraft & Motors Corp. announces its Lambert-powered plane will now be known as the Arrow Sport 90 as is the LeBlond-powered model. According to Pace Woods, sales manager, six of these craft have already been ordered

N.Y. Aero Bill Vetoed

ALBANY (N Y)—Governor Roosevelt has vetoed the Wallace Bill which had previously been passed by the legislature despite opposition on the part of the New York State Aviation Commission The proposed law would have classed as misdemeanors failure on the part of an aircraft operator to report an accident, meddling with numbers and marks on planes, and affixing unlawful numbers and marks on machines

N.A.C.A. is Awarded Collier Trophy for 1929

WASHINGTON (D C.)—To the National Advisory Committee for Aeronautics goes the Collier Trophy for 1929, emblematic of having made the most outstanding contribution to aeronautics during the past year for its development of the N A C A cowling

This trophy is awarded annually to the person or organization whose outstanding contribution to aeronautics has been demonstrated over the period of a year. The committee's award was accompanied by the following statement

"With the extended use of the radial air cooled engine, the full advantage of this particular type of engine was not realized until a satisfactory and efficient method was developed to reduce the air resistance, or drag, of the engine

"The National Advisory Committee for Aeronautics developed the means of cowling the radial air cooled engine so that the resistance, or drag, is greatly reduced This has resulted in making possible a stream lined air flow over the fuselage, increasing the speed of the airplane from 15 to 20 m p h"

The members of the committee making the award, appointed by Senator Hiram Bingham, were Mr Glenn L Martin, president Glenn L Martin Airplane Co, chairman, Amelia Earhart, Col C deF Chandler, pioneer airman, Lt Walter Hinton, president, Aviation Institute of U S A; Maj Luke Christopher, secretary of the Contest Committee of the N A A

Hawks to Referee Cirrus Race

NEW YORK (N Y)—Capt Frank M Hawks, head of The Texas Co aviation department, will referee the All-American Flying Derby, states an announcement from American Cirrus Engines, Inc, tour sponsor Maj Luke Christopher, secretary of the National Aeronautic Association contest committee is also to act in an official capacity Data on a special plane being constructed for The Texas Co and to be used by Captain Hawks in the 7 500 mi derby are not made public at this time. Among the companies which have ordered Cirrus engines for installation in specially built planes are Cessna Aircraft Co, United States Aircraft Co, Swallow Aircraft Co, and Earl Aircraft Corp The derby is to start from Detroit on or about July 21

Helium Production Investigation Sought

WASHINGTON (D C)—During a meeting of the House Mines and Mining committee on April 29, a motion was made by Representative Arentz of Nevada for the appointment of a subcommittee to make an investigation of the whole subject of the production of helium [AVIATION, Mar 22, p 614]

If the suggestion made by Mr. Arentz is accepted by the committee, the chairman will be instructed to introduce a resolution obtaining permission from the House for the necessary expenditure It is believed that an appropriation of several thousand dollars will cover the costs of such an inquiry

The meeting of the committee was called for the consideration of the Englebright bill authorizing an appropriation of $90,000 for the completion of the Bureau of Mines helium plant at Amarillo, Texas [AVIATION, Nov 2, 1929, p 904] The bill includes authority to complete acquirement of surface and gas rights in 11,833 acres now covered by a contract, and of other rights necessary for entire Federal control of gas production from the Cliffside structure at Amarillo

Need Balanced Policy

Because of the many points that have come up during the consideration of the matter, it was decided to call another hearing later on in the session when Government mining experts could be present to inform the committee as to production methods

Representative Thatcher of Kentucky pointed out that the proposed legislation involves the broad question of what the Government's helium production policy should be. He said that a balance would have to be worked out between retaining the Government plant as a standby for national protection and the fundamental policy of encouraging private enterprise to increase its production.

Representative Arentz believes that so many conflicting statements hava been made as to the comparative costs of Government production and production at a private plant, that the entire matter would seem to call for a careful investigation He proposes that the subcommittee, which he wants to have appointed to make the investigation, be allowed until December to make its report to the full committee

Fly Curtiss Planes in Greece

NEW YORK (N Y)—Word has been received from Athens, Greece, by the Curtiss-Wright Export Corp that many government officials and several thousand persons viewed maneuvers there recently of a Curtiss Hawk and a Falcon now on a foreign tour Lieut James H Doolittle heads the mission demonstrating the planes which includes Capt John K Cannon and Lieut James E Parker, both on leave from the Army Air Corps

Complete More Plans For Great Lakes Tour

DETROIT (MICH) — Plans for a 2,700-mi. Great Lakes Air Cruise, projected for this summer by the Detroit Flying Club, have gained considerable momentum and a number of local airmen see in the event one of the major aeronautical activities of the season Announcement of the proposed cruise was made several weeks ago [AVIATION, March 29, p 657] by Edward J Hill, president of the club.

According to present plans the tour, to be limited to seaplanes, amphibions, and flying boats will take place August 8-17, inclusive and will start and end at Detroit It will be non-competitive its purpose being to assist in popularizing the use of over-water aircraft Every manufacturer of over-water aircraft in the United States as well as makers of planes that can be converted into that type will be invited to participate.

Announce Cruise Officials

Wayne J, Sheldon local aeronautics manager of the Standard Oil Co., has been named cruise commander, with Paul Strasburg, pioneer Detroit airman as referee These men will be backed by a cruise committee composed of Edward J. Hill, chairman, Clark C Hyatt, Gaylord W Norton, Ray Cooper, and Maj Floyd E. Evans, and a technical committee made up of Arthur G Schlosser and James Eastman

The route now under contemplation will take the planes to approximately 30 cities in the Great Lakes and Georgian Bay district, with visits to at least three cities daily

Club officials have communicated with contact men at the following cities: Toledo and Cleveland, Ohio, Erie, Pa, Buffalo, N Y, Hamilton, Toronto, Port Hope Peterboro Barrie, Parry Sound Little Current, Sault Ste Marie Otter Head and Port Arthur, Ont, Duluth, Minn, Houghton Marquette Sault Ste Marie St Ignace, Sturgeon Bay and Cheboygan, Mich, Racine, Wis, Chicago, Ill, Benton Harbor, Muskegon Frankfort Traverse City Petoskey, Mackinac Island Alpena, Bay City Port Crescent, Harbor Beach, and Port Huron, Mich, and Detroit

To Survey Route

A pathfinding trip over the foregoing route will start from here on May 26 The pathfinding party will fly in an Eastman flying yacht furnished by the Detroit Aircraft Corp, and a Fokker amphibion furnished by Gar Wood, nationally known Detroit boat builder

Mr Wood will accompany the party in his own machine which will be flown by Duke Schiller Other members of the group will include Sheldon, Hyatt, Strasburg, and probably Cooper Mr Strasburg will pilot the Eastman, according to present plans

The Great Lakes Air Cruise will be financed jointly by the Detroit Flying Club, by subscription of Detroit business leaders, by manufacturers participating, and by cities on the route Pay passengers will be carried at $250 each

Russell Develops Cotton Chute

SAN DIEGO (CALIF)—With a canopy made entirely of cotton a new "lobe" type parachute developed by the Russell Parachute Co this city weighs but 2½ lb more than the regulation silk parachute The cotton cloth is of special construction designed to resist cord burns and mildew

Schools and Colleges

UNIVERSAL AVIATION SCHOOLS will hereafter give ten hours of instruction in tri-engine planes to all transport students it is announced Five hours will be dual time and five, solo

RAPID AVIATION, INC has added to its school equipment a ground trainer patterned after a low-wing monoplane, mounted on two sets of iron bellows and operated by electric motors

STANDARD FLYING SCHOOLS Los Angeles now has a permanent enrollment and information office on the ground floor of the recently completed Western Air Express Terminal

GREAT NORTHERN AVIATION SCHOOL St Paul Minn., recently graduated 32 students

NORTHERN AIRCRAFT CORP, Bay City Mich has established a school with C W March as president and general manager

Representatives Named

EAGLEROCK—Texas Aero & Service College Dallas Tex, for Texas

DETROIT AIRCRAFT CORP—Midwest Airways Milwaukee, Wis representative for all D A C products except Lockheed planes, for Wisconsin.

PRATT & WHITNEY — Corporacion Aeronautica de Transportes, Torreon, Mexico service representative

STINSON—Logan Aviation Co, Cleveland, distributor for Ohio

WACO — United States Air Lines, Cleveland, dealer for Cleveland and vicinity

Army Planes Stage Show at Denver

DENVER (COLO) — Thirty eight planes, half of them belonging to the First Pursuit Group under command of Maj Ralph Royce and the remainder part of the 88th Observation Squadron commanded by Maj Lewis H Brereton staged battle maneuvers here on April 30 for a crowd that thronged and overflowed the Municipal Airport The fliers were on their way to home bases after the annual Army Air Corps exercises held this year at Mather Field, Sacramento

AERONAUTICAL CALENDAR

May 27-30	All-New England Air Tour, starting from Springfield Airport, Springfield, Mass
June 28	Annual R A F Display Hendon Eng
July 20-Aug 7	International Light Plane Tour starting from Tempelhof Airport Berlin Germany
July 21	All America Flying Derby starting from Detroit Mich Sponsored by American Cirrus Engines, Inc, Marysville Mich
Aug. 9-24	International Gliding Meet, auspices Rhoen Rossiten Gesellschaft the Wasserkuppe East Prussia, Germany
Aug 23-Sept 1	National Air Races, Chicago Ill
EXPOSITIONS	
June 2-7	Northwest Aircraft Exposition the Coliseum, Minneapolis-St Paul Minn Show Director Ray Kronum 401 Wesley Temple Bldg, Minneapolis.
June 28-July 6	Pacific Coast Aeronautical Exposition Oakland, Calif Municipal Airport
July 6	International Transportation Exposition Warsaw, Poland.
Sept 6-8	International Aero Exhibition Stockholm, Sweden.
MEETINGS AND CONFERENCES	
May 14-16	National Conference, Airport Section Aeronautical Chamber of Commerce Buffalo, N Y
May 19-22	Fourth Annual Technical Aeronautical Meeting, A.S.M E. Wright Field, Dayton Ohio
May 25-29	S.A.E Twenty-fifth Anniversary Meeting French Lick, Ind
June 9-12	Semi annual meeting, A S M E, Detroit, Mich
July 3-5	Western States Aeronautical Conference Medford Ore.
Aug 26-28	S A E Aeronautic Meeting Chicago Ill
Sept. 1-6	Fifth International Air Congress, under the auspices of the Royal Aero Club The Hague Holland
AIRPORT DEDICATIONS	
May 26	Muskogee Okla. Municipal Airport
May 27	Turners Falls-Greenfield Mass.
May 30-June 1	Dedication and Air Circus, Colusa, Calif Municipal Airport
May 30-June 1	Dedication and Air Meet, Bowles Airport, Springfield Mass.
May 30-June 1	United Airport, Burbank, Calif
May 29-31	Abilene Tex, Municipal Airport
June 7	Los Angeles Airport, Los Angeles Calif
June 10	Elgin Ill, Municipal Airport.
June 20-21	Randolph Field San Antonio Tex
June 21-22	Allentown, Pa, Airport.
June 28-29	Tyler, Tex. Municipal Airport.
July 4	Kelso Wash., Airport.
Aug. 30-Sept. 1	Williamson Johnson Airport Duluth Minn

BRIEFLY

An aerial survey of Minnesota for geological and botanical purposes is being conducted under the direction of Prof William S Cooper department of Botany University of Minn It is authorized by the Science Research Bureau of Boston.

President Hoover has recommended an appropriation of $225,000 for construction of a monument at Kill Devil Hill, Kitty Hawk, N C, to commemorate the Wright Brothers' flight

W F Knight, professional parachute jumper, left a plane at 800 ft near Orlando Fla., recently, to rescue one of his pupils who had fallen into the lake.

Pawhuska (Okla) Aero Club is offering $1,500 in prizes for an aerial circus to be held July 4-6

The new $750,000 Curtiss-Wright base at Fort Worth, Tex, was formally opened April 11-13.

Nine Kinner-powered American Eagles and three Eagles with OX-5 engines have been sold recently by American Eagle Aircraft Corp Twelve more are on the production line, according to Pres E E Porterfield

C V Snyder has been named receiver for Yunker Aircraft Co., Wichita, Kan

Vacuum Oil Co is now using three planes A Challenger powered Curtiss Robin, a Fairchild KR-34 with Whirlwind 165 hp engine, and a Lycoming powered Stinson Junior.

The Firestone Tire & Rubber Co's tri-engined Ford has completed a 65,000-mi goodwill tour of the country, during which 7,500 passengers were carried

Net earnings of $3,106 659.31 for the first three months of 1930 are reported by Timken Roller Bearing Co H H Timken Jr has been elected a director, and R C Brower has been made secretary-treasurer

Earl Aviation Corp Los Angeles, Calif, has leased factory space in Glendale

Command-Aire Flying Service and members of the 154th Observation Squadron Arkansas National Guard, staged a flying circus April 28 at the Prescott, Ark, airport.

Col Edward A Deeds, vice-president of National City Bank of New York has purchased a Sikorsky S-39 for the purpose of commuting between the city and his yacht "Lotusland" A special nest for the plane has been built on the deck

J H Needham, professor of entymology at Cornell University, has completed a 3000 mi airplane trip in South America during which he collected many valuable specimens for the University

The Army Air Corps has undertaken to make a photographic survey of Washington, D C as an aid to solution of the city's traffic problem

Lieut Harold Bromley is now conducting load tests of the Lockheed Sirius which he will attempt to fly from Tacoma to Tokio. The plane has a detachable landing gear which will be dropped after the takeoff

An open competitive examination will be held by the United States Civil Service Commission for the position of senior inspector of aircraft in the sixth district, including Ohio, Indiana, and Kentucky Other vacancies will also be filled as a result of the examination.

The annual aviation luncheon of the National Association of Commercial Organization Secretaries was held in Washington, D C, May 1 Speeches were made by W Irving Bullard Lester D Gardner F H Russell Gen John F O'Ryan, W G Herron and A P Barrett Need for larger and faster planes was emphasized.

Air maneuvers simulating attack and defense of Phillips Field Aberdeen Proving Grounds, Md, will start May 12 The field will be defended by the First Pursuit Group, Selfridge Field, and the 62nd Coast Artillery Anti-Aircraft Regt. from Fort Totten, N Y, while the attack will be conducted by the Second Bombardment Group from Langley Field and the Third Attack Group, from Fort Crockett, Galveston, Tex About 41 planes will be used altogether

All of the Aviation Squadrons from the Atlantic Battle Fleet, comprising 160 planes, will take part in maneuvers in the vicinity of the Anacostia Naval Air Station, Hampton Roads, Va., as an accompaniment to the Curtiss Marine Trophy Races which will be held there May 24 An entry list of 24 has been received for the races

Two aircraft manufacturers and 22 makers of parts and equipment selected Bridgeport Conn, as headquarters during 1929 giving the city a total of six aircraft manufacturers and 42 equipment makers Hartford Waterbury, and New Britain have 21 nineteen and fifteen manufacturers of aircraft parts and accessories, respectively

Allen Aircraft Engine Co Compton, Calif, has a 200 hp eight-cylinder air-cooled engine ready for tests The cylinders are horizontally opposed in banks of four. W C Allen, chief engineer, was the designer

Weifenbach Aeroplane Service, Inc, Appleton Wis, has been dissolved

Brubaker Aerial Surveys, Portland, Ore has completed mapping a strip 1½ mi wide along the Columbia River from the Snake River to the Canadian border for the U S Geological Survey

New Firms Announced

ALLIED AIRCRAFT, INC. 402 Pioneer Bldg, Seattle, Wash; capital, $45,500, by T Nygard, Joseph Matsen, and A L Haggard

IMPERIAL AIRCRAFT CORP, 1136 Linden St, Camden, N J; capital stock, 12,500 shares, par value $10 each; J E. McCusker president Alfred B Obenland vice-president, Leighton J Heller, secretary, William F Havs treasurer; to manufacture sport planes and gliders

PERSONNEL

FREDERIC G COBURN, president of The Aviation Corp, is now president of American Airways, Inc., succeeding JESSE F HAMILTON, resigned

HARRY Y MAYNARD, formerly publicity director for Metropolitan Airport, Los Angeles, has opened a specialized aeronautic publicity office at 6605 Hollywood Blvd Hollywood, Calif.

A FRANCIS ARCIER succeeds RUSSELL F HAANY as chief engineer for Waco Aircraft Co, Troy, Ohio Mr Arcier was engineer for Handley Page, Ltd, during the War, and has since been engineer for Atlantic Aircraft Corp and vice-president of General Airplanes Corp He was associated with the designing of the War-time Handley Page bomber of the General Mailplane, and of many other well known machines

A F Arcier

J A BRERETON has been elected secretary of Detroit Flying Club succeeding FOYE SHUMAKER, resigned on account of illness.

WALTER SMITH has been placed in charge of the ground school for Rapid Aviation, Inc, Council Bluffs, Ia, and Omaha, Neb

MAX W CLOWERS has been made traffic manager at Moline (Ill.) airport for Curtiss-Wright Flying Service

MAJ JOHN O GOETZ director of C. Dallas Inc, school at Buffalo, N Y, has been transferred to the Geneva, N Y, airport, where he will be general manager

L W GREVE and J F WALLACE, acting head and chief engineer respectively, of Cleveland Pneumatic Tool Co, are in Europe visiting manufacturers who use Aerol Struts

H CUTLER has been appointed sales manager for Universal Aviation School at Memphis, Tenn FRANK SCHULZ, JR., will assist him

EUGENE L. KLOCKE has been named chairman of a committee of the Aero Club of Buffalo, N Y, to arrange for the air circus to be held in June

BLAKE M WILSON was elected president of the Aero Club of British Columbia at the annual meeting A D BELL IRVING is vice-president and LEONARD MILLER, secretary-treasurer

J CURTIS HOLMES has been appointed manager of Lovell Field, municipal airport at Nashville Tenn, which will soon be dedicated.

M A HUTCHINSON, Syracuse N Y, has been made district sales manager for American Eagle Aircraft Corp

PAUL E GRASSFIELD was recently named aviation bureau director of the Florida State Chamber of Commerce

AIRPORTS AND AIRLINES

Tests of Hangar Sprinklers Ended

Official Report to Be Issued by Committee

WASHINGTON (D C)—The exhaustive series of tests of the value of various sprinkler systems in controlling hangar fires of all kinds was continued through last week at the Bureau of Standards here and came to a conclusion Friday, May 2. The official report of the fact-finding committee, which conducted the tests under the auspices of the National Board of Fire Underwriters and various government groups, is being compiled and will be issued soon. This report will contain the official timing of each test, the water pressures throughout the system, the volume of water used, temperatures under the roof of the hangar and comments of the official observers as to the conditions encountered.

It is expected that this report will be of great value since it represents an expert and official investigation of the operation of sprinklers in hangar fires—a subject which has caused considerable controversy between fire underwriters and sprinkler manufacturers on one side and commercial and military aviation on the other The latter have been loath to accept the claims of the underwriters, believing that sprinklers were unnecessary, or ineffectual and in any case too expensive to install

Sprinklers Appear Efficient

Pending official reports, the tests may be said to have demonstrated quite convincingly the following points

1 That the sprinkler system is able to keep most fires from spreading after the water has been turned on Gasoline and oil will continue to burn, of course, but without much further damage to hangar or contents.

2 That under practically all conditions the hangar is not damaged much and that only when conditions exist such as presented by large quantities of spilled gasoline, permitting rapid spread of fire before the water is turned on, is there general damage to the entire contents of the building

3 That aluminum paint offers considerable protection to the wooden structure.

The wooden hangar measured 66 x 80 x 28 ft Under the roof were installed 100 sprinkler heads manufactured by fourteen companies in the National Automatic Sprinkler Association The individual companies drew lots for position of their heads under the roof Each head was used in each test, no matter what particular system (quick-opening, dry or wet pipe) was being demonstrated. The quick-opening or deluge system involves a dry pipe with actuation through a thermostat control in the hangar roof The dry and wet pipes systems are actuated by melting of fuses, the wet pipe being one filled with water which is released at once when the fuse melts and the dry pipe being filled with air holding water back in the supply pipe until the pressure is released by the melting of the fuse and the water thus allowed to rush through to the head

Tuesday morning, April 29, the quick-opening or deluge system using both overhead and floor heads were

(Concluded on page 984)

Air Ferries Plans Expansion

SAN FRANCISCO (CALIF)—Air Ferries, Ltd., of this city, plans to start service to Sacramento and Stockton, Calif, from San Francisco upon the arrival of Keystone-Loenings from the factory at Bristol, Pa The line now operates between here and Oakland and Vallejo

New Mail Rates Based on Watres Bill

WASHINGTON (D C) — President Hoover signed the Watres bill on April 29 and on May 5 the Post Office Department took the first action under its provisions This was to issue certificates to C.A.M. routes 1-5, inclusive. The rates fixed in the certificates run until December 31 while the certificates themselves run until April 5, 1936 The routes and operators involved are as follows Boston-New York, Colonial; Chicago-St Louis, Roberton; Chicago-Dallas, N.A.T.; Salt Lake City-Los Angeles, W.A.E., Salt Lake City-Pasco, Wash, Varney

Under the arrangement provided for in the bill, that the rates shall be based on space and mileage rather than on poundage, the new rates of payment have been arrived at on the basis of 9 lb of mail to the cubic foot. The new rates for the above routes, together with the variables for extra compensation in the case of night flying, mountain flying and flying in fogs, respectively, on the various routes, are as follows:

No. 1—$.69, $.86½, $.88½ No 2—$.59½, $.63½, $.67 No 3—$.80½, .95½ No. 4—$1.07½, $1.14½, $1.17, $1.17½ No 5—$.83, $.98

W.A.E. at the same time was given permission to extend its service to San Diego and Varney to Spokane, Portland and Seattle

Final Conference Program Announced

NEW YORK (N Y)—The final program for the Second National Airport Conference to be held at Buffalo next week (May 14-16) has been announced As announced before, the two features will be the holding of committee sessions, each specializing on some phase of airport operation, and a display of airport equipment in the foyer of the Hotel Statler, which will be the conference headquarters Every delegate will be assigned to one of the ten committees, in accordance with his preference The committee meetings will be held on the afternoon of the first day and their reports will be heard at the morning and afternoon general sessions the next day

The program, in brief, is to be as follows:

WEDNESDAY, MAY 14

12 15 p.m. Opening Luncheon Address—"The Terminals Place in Transportation"—Julien L. Eysmans, Vice-President, Pennsylvania Railroad

2 30 p.m. Committee Sessions.

1 Accounting Committee—Chairmen, E. A. Johnson, President, Dayton Airport.

2 Hangar Construction Committee—Capt. Ralph H Higgins, Chief Engineer, N.A.T

3 Surfacing and Drainage Committee—T R Newell, Chief Engineer Cleveland Municipal Airport.

4 Servicing and Storage Committee—H. H. Mills, Manager, Brainard Field, Hartford

5 Lighting Committee—Maj John Berry, Manager, Cleveland Municipal Airport.

6 Seaplane and Amphibion Base Committee—Andrew Heermance, Director of Aviation Miami

7 Traffic Handling Committee—C. W Short, Jr., Manager, Municipal Airport, Tulsa

8 Concessions Committee—W Sanger Green, Manager Central Airport, Camden

9 Sales and Advertising Committee—R F Craig Fairfax Airport, Kansas City

10 Small Town Landing Fields Committee—Frank L. Bertschler, Airport Director, Beaumont, Tex

2 30 p.m. Airport Equipment Manufacturers Meeting Curtis Main, Aqua Systems Inc.

7 p.m. Consulting Airport Engineers Dinner A. W Sowden Vice-President, Airport Development and Construction Co, Toastmaster

THURSDAY, May 15

9 30 a.m.—12 Noon—General Session Col R. B Barnitz, Director of Aviation City of Los Angeles, Chairman. Reports will be read by the Chairmen of the following committees. Each report will be followed by discussion Thirty minutes will be allowed for each subject 1. Accounting, 2 Hangar Construction, 3 Surfacing & Drainage 4 Servicing & Storage, 5 Lighting

12 15 p.m. Luncheon Maj R. H. Fleet President Consolidated Aircraft Corp., Toastmaster Short talks by Hon. Frank Cannon Commissioner of Parks City of Buffalo and Maj E. E. Aldrin, Chairman Fuel & Lubricants Section, Aeronautical Chamber of Commerce Capt. Frank Hawks, "Gliding as an Airport Activity"

2 p.m.—5 p.m. General Session David C Logg, Manager, Boeing Field, Seattle Chairman Reports will be read by the Chairmen of the following Committees. Each report will be followed by discussion Each subject limited to 30 min 6 Seaplane & Amphibian Bases, 7 Traffic Handling, 8 Concessions, 9 Sales & Advertising, 10 Small Town Landing Fields,

(Concluded on page 982)

S.A.F.E. Co-operates With T.A.T.-Maddux

NEW YORK (N Y.)—Southwest Air Fast Express, T.A.T.-Maddux and the Pennsylvania Railroad have combined in a new air-rail service between this and intervening cities and the Southwest effective May 1. The new aspect of the arrangement exists in the operation by Safeway of another Ford transport daily between St Louis and Fort Worth connecting at St Louis with the regular transcontinental planes Other Safeway operations out of St. Louis will be continued as heretofore.

The fare between this city and Dallas and Fort Worth is $88 42; between here and Oklahoma City is $77 93; and Tulsa $72 43. This fare includes a lower Pullman berth and extra fare on the train between this city and Columbus. The service enables transportation between here and Dallas in about 24 hr, a saving of about 18 hr over the all-rail method. The schedule is as follows:

6 05 p.m.	lv New York City ar	9 25 a.m.
2 55 a.m.	lv Columbus lv	7 46 p.m.
12 55 p.m.	lv St. Louis lv	2 15 p.m.
3 55 p.m.	lv Tulsa lv	9 15 a.m.
6 15 p.m.	lv Dallas lv	7 35 a.m.
6 45 p.m.	ar Fort Worth lv	7 30 a.m.

West Coast Lowers Rates

PORTLAND (ORE.)—West Coast Air Transport has lowered its rates. The fare between San Francisco and Montague, Calif, now is $25 instead of $30 and between Seattle and Montague is $35 instead of $40

Pittsburgh Airways Operating Line

NEWARK (N. J.)—Pittsburgh Airways, Inc, has been operating for several weeks a daily passenger service between here and Bettis Field, Pittsburgh, by way of Philadelphia. Theodore Taney is operations manager with offices at the local municipal airport. The fare is $35 one way or $65 round trip. Travel Airs are used. The schedule is as follows:

9 30 a.m.	lv Newark	6 45 p.m.
10 30 a.m.	lv Philadelphia lv	5 35 p.m.
1 45 p.m.	ar Pittsburgh lv	2 34 p.m.

Mail Lines Round Out Operation Periods

NEW YORK (N Y.)—Two mail lines recently celebrated anniversaries On April 30 Eastern Air Transport, formerly Pitcairn Aviation completed 2 yr. of its operations and on May 1 Universal completed the first year of its operation between Kansas City and Omaha.

The old Pitcairn service began operating May 1, 1928 between New York and Atlanta with service both ways daily over the 760-mi route. This daily scheduled mileage of about 1,500 mi has grown to 5,160 mi daily. Up to April 30 the company's planes had flown 2,230-006 mi and 765,253 lb of mail had been carried

Universal carried 115,963 lb of mail during the first year and flew 425,364 mi. The service includes a day and night run, the night run having been inaugurated Oct 1, 1929

Ship-to-Shore Air Mail Line Resumed

NEW YORK (N. Y.)—Ship-to-shore air mail service was resumed April 29 from the North German Lloyd steamship *Bremen* after suspension for the winter season. The plane left the steamer early in the morning when about 350 mi east of New York and about 150 mi east of Nantucket Light, the trip requiring about 3½ hr. About 10 lb of mail were carried

Jobst von Studnitz, the pilot, reported the trip was without incident and expressed satisfaction with the catapulting operation. The weather was so favorable that he was able to fly to Fire Island without touching the controls except for an occasional correction of the rudder. He carried with him his mechanic-radio operator who served with him last year.

The service is now operated by Luft Hansa, the German air transport organization Last year the pilot and crew were merely borrowed by the steamship company from Luft Hansa About the only change in equipment is the installation of a windbreak for the protection of the plane during the voyage A new operation feature is the storage of the plane on the deck during the voyage rather than on the catapult It is shifted to the catapult by a special track when the time arrives for the launching

The range of the plane has been increased by the installation of larger gasoline tanks so that it may fly about 8 hr without refueling instead of about 6 hr, as last year. This means that the plane will be able to leave the ship further from shore than before. On the eastbound trip the plane will land first at Southampton, refuel and then proceed to Cologne where the mail will be distributed to the general German air mail system.

Mason & Dixon Resumes Service

DETROIT (MICH.)—Mason & Dixon Airlines, operators of a passenger service between Detroit (Ford Airport) and Cincinnati (Lunken Airport) via Dayton (Vandalia Airport), which service was discontinued during the winter months, resumed operation Monday, April 28 Two planes are flown twice daily, each way, except Sunday. The company uses all metal Flamingo monoplanes. Planes will leave Ford Airport at 10 40 a.m and 4 30 p.m and arrive from Ohio at 1 20 p.m and 7 10 p.m., the trip time being about 2 hr. 40 min. Fare is $15

Spokane-Seattle Line Opened

SPOKANE (WASH.)—Daily passenger service between Spokane and Seattle was started May 3 by the Mamer Air Transport, with the departure of a plane at 8 a.m from Felts Field, here. The service will be included in the Spokane-St. Paul passenger line to be started soon by the same company. The trip requires 2 hr 25 min Planes leave Seattle at 5 p.m.

United Airport Ready for Dedication

OFFICIAL dedication of United Airport, Burbank, Calif., the Los Angeles terminal for Pacific Air Transport and the Los Angeles headquarters for all southern California Boeing activities, has been set for May 30, 31, and June 1. The port was first opened to the public on April 26 in connection with the Air Corps maneuvers A complete program of formation flying civilian races and flying contests, and a ground program including prominent speakers and an aeronautical display will be prepared and announced shortly.

United Airport incorporates three runways surfaced with oil composition and each 3,000 ft. long. Two large hangars are completed and in use by Pacific Air Transport, Aero-Pacific Corp., Ltd., and the Stinson Aircraft Corp. factory branch. The factory of the Northrop Aircraft Corp. is located on the field as is factory and service station for Hamilton-Standard Propeller Co. An administration building is included.

AIRPORT CONSTRUCTION PROJECTS

West

PLANS for the development of Waubilla Aviation Country Club on a 300-acre site in Bear Valley, Marin County, have been announced. The first unit of development will be a landing field with runways 3,000 ft. and 2,000 ft. long, respectively, and 300 ft. wide. A steel and concrete hangar for the planes of club members, will be constructed and the field will be equipped with lights. Other units of development will consist of a golf course, hard-surfaced tennis courts, stables for riding horses, hand ball courts and a swimming pool.

The contract for steel work on Hangar 3 at the Los Angeles Municipal Airport, has been awarded to the McClintic-Marshall Company for $8,890, the work to be completed in 21 working days. It is expected that the hangar, at a total cost of $50,000, will be ready for occupancy by July 1. It is to be 133x200 ft., and construction is of steel, concrete, and masonry. Unit 2, a 120x200 ft.-hangar, will be completed June 1 at an estimated cost of $33,000.

At the San Francisco Bay Airdrome near Alameda, Calif., work on a 120x440 ft. hangar has begun. The building is to be of fireproof construction and divided into three sections. An east-west runway, 3,400x400 ft., and a north-south runway, 1,700x200 ft., have been completed, and it is expected to have the port in condition for commercial operations by midsummer.

The Long Beach (Calif.) City Council has ordered construction of a $20,000 administration building for the Air Corps at the Municipal Airport. Complete hangar and machine shop facilities have been erected for the use of the Army reserve unit since its removal from Clover Field, Santa Monica.

An airport on the banks of Clear Lake Lucerne, Calif., with facilities for both land and sea planes, has recently been completed. The field lies at the northern edge of the lake and comprises about 600 acres, with a 2,000-ft. runway. Ramps have been installed.

At the Aero Corporation of California flying field, Los Angeles, the first two of several new shop buildings under construction have been completed.

East

The New Haven (Conn.) Municipal Airport site is being cleared of about 16,000 stumps on a 66-day contract, for $28,000, held by the Nott Plant Company of Meriden. The airport is to include 179 acres with an all-way turf surface and an artificial drainage system, the type to be selected. The city has appropriated $300,000 for the entire project which will include lighting. The land cost $65,000 and the survey by consulting engineers about $20,000.

The Olean-Hinsdale (N. Y.) Airport has been taken over on a long-time lease by Grady & Burdick, who plan the immediate construction of a three-plane steel hangar and a repair shop. The total cost of improvements at the port, including lighting equipment, will be about $20,000.

Plans for extensively improving the Jamaica Sea Airport, L. I., N. Y., announced by the Atlantic Aviation Corp., will include surfacing and the installation of runways. The official opening of the port for the summer season is announced for June 30.

As a result of the increasing use of St. Hubert Airport, Montreal, it is planned to build a direct highway from the port to the Montreal Harbor Bridge, it has been announced by the Deputy Minister of Roads.

While the Norwood (Mass.) Airport will not be ready for large-scale operations for some time, it has been announced that a temporary hangar and two 2,000-ft. runways will be ready for use by July 1.

Continental Airports, Inc., has purchased 65 acres at Milford, Conn., for use as an airport. It is being called Hiram Bingham Field.

At the Fitzmaurice Flying Field Massapequa, L. I., N. Y., an 80x80-ft. hangar is to be built for the use of property owners at Massapequa Park.

South

The contract to build officers' quarters at Randolph Field, the Government flying school at San Antonio, Tex., has been let to Kenneth L. Colborn, Inc., Pasadena, Calif. The buildings are to be of masonry and stucco construction and include quarters for 42 company officers and 65 duplex buildings for non-commissioned officers.

Contract for grading the Birmingham (Ala.) Municipal Airport has been let at a cost of $110,750 to Millsaps, Parker and Nichols Construction Co. Approximately 300,000 cu. yd. of grading will be required.

The City of Florence, Ala., and Lauderdale County have come to an agreement on leasing a 105-acre airport site, known as the Delaney tract, and the Chamber of Commerce plans erection of hangars and other buildings.

The contract for lighting equipment for San Angelo (Tex.) Municipal Airport has been let to Graybar Electric Company, Dallas. Plans call for beacon, flood, boundary and obstruction lights at a cost of $6,865.

A site committee representing the city and civic organizations of Punta Gorda, Fla., has leased a 50-acre tract which will be developed as an airport with 1,900-ft. runways in all directions.

Work on the Daytona Beach (Fla.) Municipal Airport is reported to be nearly complete. The new field, within 3 mi. of the city, will be used as a night air mail junction.

Sinton (Tex.) landing field, a 90-acre tract, has been graded and fenced. Further improvements call for installation of a 24-in. beacon of 2,000,000 cp. and boundary lights.

NYRBA Plans Tours For Salesmen in S. A.

NEW YORK (N. Y.)—Every month, beginning June 6, what it calls a Trade Extension Cruise will be operated through major South American points by New York, Rio & Buenos Aires Line, Inc., using Consolidated Commodore flying boats. This monthly tour has been arranged for the benefit of American business house representatives on the basis of advantages offered by plane travel over the slower means of surface transport prevailing on that continent.

The trips will start from Miami on the sixth day of each month. Twenty-three important Latin American trade centers will be visited and the cruise will occupy 75 days, 49 of which will be spent in residence at the points of call. The cost will be $4,280, including living expenses, guides, interpreters, office accommodations, and incidental transportation.

Covering the same territory by usual means of travel would consume about 234 days, the company estimates. There would be a corresponding outlay in cost of transportation and in salesman's salary for territory coverage. NYRBA plans to have its local representatives in Latin America arrange contacts in advance and provide special co-operation for each member of the cruise in accordance with the nature of each individual's business.

The company has been operating since February a weekly mail service almost the east of South America between Buenos Aires and Miami.

Conference Program

(Concluded from page 960)

7 p.m. Conference Banquet. Kenneth A. Wood, Toastmaster. Address: "Aviation and the American Merchant Marine," M. B. Rodgers, Vice President, United States Lines. Address: "The McNary-Watres Act," Mabel Walker Willebrandt, Counsel, The Aviation Corp.

FRIDAY, May 16

9:30 a.m.—12 noon. General Session. Victor Vernon, Vice President, Curtiss-Wright Airports Corp., Chairman. Address: "The Layman's View of Aviation," W. R. Needham, *Hotel Management*, New York. Address: "Reducing the Weather Hazard," W. R. Gregg, Weather Bureau. Address: "Municipal Airport Policy," Col. C. O. Sherrill, City Manager, Cincinnati, Ohio.

12:15 p.m. Luncheon. B. E. Fulton, National Chairman, Airport Section, Aeronautical Chamber of Commerce, Toastmaster.

2 p.m. Bus leaves hotel for Buffalo Municipal Airport.

2:45 p.m.—9 p.m. Equipment Demonstrations at the Airport.

Felts Field Rates Established

SPOKANE (WASH.)—The following rates have been established at Felts Field, the local municipal airport. Ground rental per year, $.03 a square foot for a minimum of 100 sq. ft., $1.00 a day or $15 a month charged for planes staked out on the field; 25 per cent assessment on gross revenue of operators not based at the field. The city will realize a profit of $.06 per gal. on gasoline sales and $.10 per gal. on oil. Last year 50,000 gal. of gasoline were sold.

Airway Briefs

International Airways, Inc., which will operate a passenger service from Kansas City to Mexico City, has opened branch offices at 1211 Athletic Club Bldg., Dallas, Tex., with A. A. Nauhn, vice president, in charge.

The committee on Harbors and Public Lands of the Massachusetts legislature has reported out a bill to permit the Department of Public Works to lease from time to time such additional land as may be needed by the city of Boston for the airport.

Colonial expects soon to increase the Boston-New York service to four round trips daily, with planes starting from each point at about 8 a.m., 12 m., 3 p.m., 6 p.m.

Colonial Flying Service is being discontinued at Utica, N. Y., and Hartford, Conn. John Wright has taken it over at Utica, and will operate as Wright Flying Service. At Brainerd Field, Charles Descomb has taken over the Colonial hangar and has organized Descomb Flying Service, Inc. Colonial mail planes will still be serviced at the hangar.

Janesville (Wis.) City Airport Co. has been incorporated to operate Krause airport which was recently established by the city.

Mateas Elizondo, president of Monterey Steel & Foundry Works, Monterey, Mexico, is said to be planning establishment of a San Antonio-Monterey line.

After one unsuccessful attempt, mail was dropped from the "Los Angeles" to the deck of the S.S. "Leviathan."

Sale of Hog Island to the city of Philadelphia for use as an airport, at a price of $3,000,000, has been formally approved by the U. S. Shipping Board.

Seven beacons between Suwanee and Gallup, N. M., are being removed, as the route has been found unsatisfactory. This does not affect the Albuquerque-Clovis route followed by T.A.T.-Maddux.

Falls City, Neb., has refused to release Porterfield Aviation Interests, Inc., from a contract calling for establishment of a flying school and payment of $750 annual rental at the Falls City municipal airport.

Commercial Air Transport Inc., is said to have sold its Everett-Marysville (Wash.) line to Allied Aircraft, Inc.

Air mail may now be sent from Montreal to Buenos Aires. The rate is $.60 per half ounce. Rates to Canal Zone, Venezuela, Colombia, Peru and Ecuador are from $.25 to $.55.

Official permission for the S. S. "Bremen" to operate ship-to-shore air mail service has been granted by the United States State Department.

Considerable increases of air mail in March over any previous month are reported at Denver, Colo., Boston, Mass., and Tampa, Fla.

Justice MacCrate of the Brooklyn Supreme Court has dismissed the $1,000,000 suit brought by Charles V. Bob & Co. against William T. Hollingsworth and Claude Neon Lights, Inc., on the grounds that plaintiff had no cause for complaint.

Pittsburgh Motor Coach Co. expects to establish hourly bus service between Pittsburgh and McKeesport, past Bettis Field, May 10. Buses are to run from 7 a.m. to 12 p.m.

Blaine M. Tuxhorn, operator of Tuxhorn School of Flying at Kansas City (Mo.) Airport, plans inauguration of passenger lines to Columbia and Jefferson City.

Western Air Express has transferred the base for the Catalina Island line from Valley Boulevard Field to the Western Ave. Field of Aero Corp. of Calif., now a W.A.E. subsidiary. Analysis has shown the latter field to be nearer the sections of the city from which most of the traffic originates.

A new fixed code airway beacon has been introduced by General Electric Co. Six of the units have been installed as obstruction lights on the new Suisun Bay bridge built by the Southern Pacific Railroad, and three have been mounted on the high voltage transmission towers of New York Power & Light Corp. at Whitehall.

Robertson Airlines has purchased three new Ryan broughams to add to those in use on the new St. Louis-New Orleans route.

Opposition to the Catfish Point site for an airport at Tampa, Fla., as laid out by city engineer Cason, has been raised by proponents of a cheaper location nearer the city.

Nearly 4,000 passengers were carried on sightseeing trips over Washington, D. C., Easter weekend.

Commercial flying companies and light airplane clubs in Canada have flown a total of 6,284,079 mi. with an average of 216,692.4 mi. per accident, last year.

Suits filed by United Aircraft & Transport Corp. against N.A.T. have been dropped as a result of the recent merger.

Management of Alameda (Calif.) Airport has been taken over by Curtiss-Wright Flying Service from Curtiss-Wright Airports, Inc. The latter firm will continue development of the port facilities.

Varney Air Lines piled up a total of 106,074 mi. of operations in March, with only two forced landings, neither of which resulted in damage. Performance was 96 per cent perfect.

Western Canada Line Reports

WINNIPEG (MAN.)—Western Canada Airways, Ltd., which inaugurated daily service between this city and Calgary and between Regina and Edmonton on March 3, had experienced the following traffic up to and including April 20. Passengers carried over above routes, about 350; average number of passengers per day, 18; total pounds of mail, 25,183; average pounds of mail per day, 503. The Winnipeg-Calgary and Regina-Edmonton lines use Regina, Sask., as a junction point. The company has been operating the winter service to Aklavik, in the Yukon.

T.A.T.-Maddux Flies Extras on Week-End

LOS ANGELES (CALIF.)—H. W. Beck, traffic manager for T.A.T.-Maddux Air Lines, has announced that starting May 3 two planes were to be run regularly each Saturday and Sunday over the transcontinental route in both directions. The announcement stated that regular week-end traffic has been so heavy as to warrant the regular operation of the double-header. The same service is projected for the daily schedule in the near future. During one week, recently, T.A.T.-Maddux reports operating ten double-headers, two over the transcontinental route and the rest over the route between San Francisco, Los Angeles-San Diego. Traffic over the coast line is reported to be more than twice as heavy as at the same time last year. An increase of 50 per cent was registered during the first week that the new summer excursion fares were placed in effect on the Los Angeles-San Diego run.

Mr. Beck's report further reveals that during the first quarter of 1930 the number of women carried increased 56 per cent over the preceding quarter. The first quarter of 1930 also showed a gain in total traffic of nearly 80 per cent as compared with the last quarter of 1929. During 1929 air passenger traffic increased 291 per cent over 1928 and an even greater increase is expected during 1930. A significant portion of the statement shows that of all westbound passengers on the transcontinental T.A.T.-Maddux route, 60 per cent have never been to California before.

Minneapolis-Canada Line Changed

MINNEAPOLIS (MINN.)—Reduction of fares for the Minneapolis-Winnipeg division of Northwest Airways, Inc., and a change in operating schedule of the line, which makes one trip each way weekly, has been announced. The one-way fare from the Twin Cities to Winnipeg is reduced from $40 to $30, with the round trip fare reduced from $70 to $50. Fare between the Twin Cities and Fargo is reduced from $30 to $20. At the request of business men using the line, the service is changed so that the northbound trip is made each Tuesday instead of Saturday, and the southbound trip each Wednesday instead of Sunday. Planes now leave here each Tuesday at 8:55 a.m., arrive at Fargo, N. D., at 11:05 and at Winnipeg at 1:05 p.m. Returning, the plane leaves each Wednesday at 2 p.m., arriving at Fargo at 4:05 and at Minneapolis at 6:10.

Brower Extends Service

OMAHA (NEB.)—Brower Air Service, operating a passenger line between this city and Wichita, extended its service April 28 to Blackwell, Okla. If this expansion proves justified the line will soon be lengthened to include Oklahoma City. H. F. Brower, president, states

Official Hangar Fire Tests Completed

(Continued from page 960)

tested Four planes, each loaded with about 120 gal of gasoline and 10 gal of oil, were placed in the hangar and gasoline which had been spilled about under the planes was ignited by a torch drawn across the floor. The flames spread rapidly before the sprinklers had an opportunity to flood the interior but once in operation the water restricted damage to fabric and the area adjacent to tanks

That afternoon the same type of fire was set and with the same sprinkler system, except that only the overhead heads were used This was the most exacting test for the quick-opening type of sprinkler It was somewhat slower in controlling the flames. The fabric was well burned away and the spars and ribs suffered, probably for the most part beyond repair This was an extreme condition, the atmosphere encouraged a quick, hot fire, in contrast to the damp atmosphere prevailing at the time of the morning test In both tests the temperature rose to about 2,000 deg F, and the flow of water onto the fire was between 2,800 and 3,000 gal per minute.

Leaking Tank Tested

One test was made Wednesday, April 30. This consisted of a fire started in the fuselage from a leaking tank, and with the dry pipe system in operation. The adjacent planes were so arranged that it would be possible for the flames to spread The fire was confined to the original plane except for slight damage to an adjacent wing About 45 heads operated, forming a quadrant of water in the corner of the hangar where the blaze was located The temperature at the top of the hangar was about 420 deg F

Tests with wet pipe and dry pipe alone were held on the next two days For the wet pipe test, fire was ignited in one plane, with the three other planes placed in close proximity to it. Although the fabric on the first ship was consumed the sprinklers were successful in preventing the fire from spreading to the other planes.

Climax on May 3

Friday's fire, that in which the dry pipe system was to be put to its most extensive test, was expected to prove disastrous. Gasoline under three large planes was ignited by drawing a flaming torch through it In the dry pipe system a fuse on the sprinkler head must be melted by the heat, and the air exhausted from the pipe before the water begins to flow. Terrific heat, greater than that experienced in any of the previous tests, developed before the sprinklers got to work. Flames estimated at 30 ft long shot out from the hangar opening However, once the sprinklers started, their action in extinguishing the fire was extremely rapid

In 12 min the fire had been extinguished and the sprinklers turned off The three large planes were stripped of their fabric On the small plane the left lower and upper wing panels and part of the upper right wing panel were gone. The hangar was undamaged

During the whole course of the tests there have been no explosions, although small rips have appeared in some of the gas tanks For 1½ hr, while sprinklers played on it, gasoline poured from a 4-in. horizontal rent midway up the side of a 140-gal tank in a Loening amphibion, in one of the earlier tests Flames fed by this gas completely gutted that part of the amphibion immediately over it, but

Hangar Arranged For a Test

there was no explosion and, when the gas had dropped below the rent and only a dribble remained for the firemen to extinguish with foamite, it was found that 80 gal remained in the tank

Nolan D Mitchell of the Bureau of Standards, who served as Superintendent of Tests, probably will write the first draft of the committee's report Several editions of this report may be drawn up from the written comment of the committee members, who number among them representatives of the trade, the Army and Navy the N A C A and the A C C A, the underwriters and sprinkler associations and the Department of Commerce.

Western Union Sells Air Tickets

NEW YORK (N Y)—Western Union Telegraph offices now are being used as ticket agencies for trips between New York and Boston on the Colonial System of American Airways, Inc. The Western Union offices co-operating in this service are those included in the area bounded by Washington and Pittsburgh on the south, Rochester, N Y, on the west, and Bar Harbor, Me., on the north The money and reservation are telegraphed by Western Union to the Colonial main office In case of a cancellation the prospective passengers are notified also by telegraph

Inspector Reports On Newark Port Fire

NEWARK (N J)—Following a second inspection of the recent fire in the Colonial hangar at the local municipal airport, Inspector H E Ledward of The Schedule Rating Office of N J has made a report, which follows

"It appears definite that the Fairchild was midway between No. 1 and No 2 bays of the hangar with wings folded back, while several men were working on it, when fire suddenly occurred in the left wing, due to a short circuit in wire leading to the landing light Within the next two or three minutes, the following occurred

'While one employee manually tripped the Deluge valve controlling sprinklers in bay No 2 wetting down the plane, as well as the workmen it being noted that sprinklers in bay No 1 functioned automatically a few seconds later, other workmen seized one quart Pyrene and 2½-gal Phomene hand extinguishers to combat the fire There were no floor sprinklers in the section where the plane was stored Comment was made by employees to the effect that extinguishing agent in these hand extinguishers while no doubt retarded the fire were of insufficient force and apparently flowed off of the wing preventing their having full effect. Meanwhile another employee backed a tractor which was also stored in the hangar up to the still-burning plane with which it was removed from the hangar and a 40 gal portable Phomene extinguisher was immediately discharged on the remaining fire and thereby extinguished Employees observed that it seemed to be the force or pressure from this 40 gal extinguisher as much as the Phomene which finally extinguished the remaining fire

From the foregoing, it will be noted that it was the combination of both sprinklers and chemical extinguishers which were ultimately responsible for successful extinguishment of the fire. Four 1 qt Pyrene, four 2½ gal Phomene and one 40 gal portable Phomene chemical extinguishers were discharged Without the initial benefit from the action of the sprinklers, perhaps the extinguishers alone would not have been sufficient. Mr Perkins stated that while the extinguishers and sprinklers were holding the fire to some extent it is doubtful in his mind as to whether they would have completely controlled the blaze However the deduction is that for best protection all types of extinguishing agents are necessary and desirable'"

Pickwick Suspends Service

LOS ANGELES (CALIF)—Approval of the Mexican government has been obtained for a temporary suspension of service on the tri-weekly air route operated between Los Angeles and Mexico City by Pickwick-Latin American Airways, effective April 23, according to an announcement by Charles F Wren, president. It is said that the suspension will remain in effect pending the operation of the Watres bill and expansion of this country's foreign air mail service Mr Wren states in his announcement, that it will be necessary for the Pickwick company to obtain a U S foreign air mail contract in order to make the Mexican route profitable The suspension is for an indefinite period and no information is available at present as to when service will be resumed or as to whether Pickwick will resume operations of the Los Angeles-San Diego or Los Angeles San Francisco routes

Cleveland Gets Prop Station

CLEVELAND (OHIO)—A commercial propeller service stations has been installed at Cleveland Airport by Stout Air Services The shop is equipped to repair steel propellers

FOREIGN ACTIVITIES

Mexico Will Enlarge Air Force and School

MEXICO CITY (MEXICO)—Mexican Ministry of War and Marine has authorized the purchase of 60 additional airplanes, 30 of which will be for the Army Air Service, and 30 for the School of Applied Aeronautics The planes themselves will be built at the aircraft factory recently established by Gen Juan F Azcarate and associates. Engines will be purchased in the United States by General Azcarate and Gen. Rafael Aguirre, who will soon make a trip to the United States for this purpose

With the 30 planes for the Air Service, a second air regiment will be created The first unit, established last year, is under the command of Col Pablo L Sidar It is equipped with 22 Vought Corsairs and Douglas 0 2 M's, and twelve Bristol fighters. The Corsairs have Wasp engines, the Douglas planes have Hornets, and the Bristols have 300 hp Hispano Suiza engines The School of Applied Aeronautics, under the direction of Col Samuel C. Rojas, now has 21 planes, ten of which are Mexican, and the others of several different makes

German Claims Light Plane Mark

DARMSTADT (GERMANY)—A new international spred record for planes of the first category (two-seaters weighing less than 881 lb) was claimed April 22 when pilot Neiningen covered a distance of 625 mi at an average speed of 134 3 m p h He flew a D 18 plane, designed and built by the aviation group at the University of Darmstadt An altitude of about 14,200 ft was reached in the same plane carrying both pilot and a passenger The new record if homologated, would supercede the record of 127 m.p h made last winter in an Inland Sport monoplane with Warner engine

Duchess Makes Record Trip

LONDON (ENGLAND)—Flying to Cape Town and return in 21 days, the Duchess of Bedford and the crew of her Fokker monoplane (Jupiter engine), Capt. C D Barnard and Robert Little, established a new record for the trip Their actual flying time, however, was about 200 hr 25 hr more than the flying time required by Sir Alan Cobham in making the same journey The 65-yr-old Duchess herself piloted the plane during part of the flight. The plane was delayed on the return trip by a forced landing near Sofia Yugoslavia, but there was no serious damage

French Girl Sets Duration Mark

LE BOURGET (FRANCE)—A new duration record for women was made May 2 by Mlle. Lena Bernstein when she completed a non-stop flight of 35 hr, 46 min., 55 sec Thus exceeds the previous record, made by Mlle Maryse Bastie, by almost exactly 9 hr Mlle. Bernstein flew a Farman plane with 230 hp Salmson engine Her record is only about 5 hr, less than the solo endurance record for men The plane carried 2,000 liters (slightly under 500 gal) of gasoline, which was entirely used up in the course of the flight

Reduce Moth Prices; Offer Gipsy Two Engine

LONDON (ENGLAND)—Reductions of from $122-$390 in the prices of Moth planes have been announced by DeHavilland Aircraft Co., Ltd The standard Gipsy Moth now sells for $2 890 as a landplane, and $4,260 as a seaplane, as compared with previous prices of $3,280 and $4,600 The lesser reductions are made in the prices of special models, with steel fuselage construction The special landplanes sell at $3,275 with the Gipsy One engine, and $3 650 with the new Gipsy Two engine The Moth III recently announced, has been christened "Puss Moth," and priced at $4 860

Following extensive tests, including those required by the Air Ministry, the Gipsy Two has just been put into commercial production While it is similar to the Gipsy One the stroke has been slightly lengthened, and it has an enclosed overhead valve gear running in oil By these and other refinements, the engine has been made to deliver 115-120 hp, as compared with 100 hp for the Gipsy One

Report Light Plane Tour Entries

BERLIN (GERMANY)—Up to the preliminary closing date, April 15, 74 planes had been nominated to enter this year's International Light Plane Tour Of these, Germany nominated 30 France 14 (AVIATION, May 3), Poland 16, Great Britain 6, Switzerland 4 Austria 4 Some further entries may be received before May 15, the final closing date Of the German and Austrian planes entered, 27 are equipped with German engines, and 23 of these will be the new inverted Argus four-cylinder engine. Twelve of the planes are BFW, seven Klemm four Arado three Phoenix and three Albatross Only two Junkers are entered Many of these planes are new models some of which have been specially designed with the tour in mind

Australian Air Report Recommends Changes

CANBERRA (AUSTRALIA)—Considerable reductions in the activities and size of the Royal Australian Air Force were recommended in the recent annual report of the Auditor-General. It is also announced that the Government will not renew contracts for subsidized services at present operated by Larkin Aircraft Supply Co, Ltd., on the following routes Adelaide-Cootamundra, Melbourne-Hay, Mildura-Broken Hill. Passengers carried on these routes have averaged less than one per trip, and volume of mail has not even been sufficient to pay the cost of Post Office handling

An increase in volume of traffic is reported for the routes operated by Qantas, Ltd (Charleville-Camooweal, Cloncurry-Normanton, Brisbane-Charleville, Australian Inland Mission Agreement), while those operated by West Australian Airways, Ltd (Perth-Derby and Perth-Adelaide) have done about the same amount of business as the preceding year The Perth-Adelaide line was inaugurated during the 1928 29 fiscal year All of these services will be continued, giving Australia a total airway mileage of 4,404 over which regularly scheduled, subsidized lines are operated Those to be discontinued total 1,000 mi

Figures for Year's Operations

Following are the figures for total operations by all services during the fiscal year 466,196 mi flown, 3,415 passengers carried, 127,418 lb freight carried; 528,405 letters carried, $441,500 subsidies paid; $67,735 air mail fees received. Because of the large amount of subsidy in proportion to goods and passengers carried, the Auditor-General said, "It would appear that, according to the degree in which the company makes a financial failure or success of their concern over the period, so is the Departmental subsidy, respectively increased or decreased to provide a fixed return on capital invested I am of the opinion that this method of fixing the subsidy is unsound in principle"

The total expenditure for civil aviation during the fiscal year was $576 000, of which $369,000 was spent for air mail services, $10,500 was paid to aero clubs for pilots trained, and $9,250 to clubs for flying allowance About $3,300 was paid to flying schools as subsidy for seventeen pilots trained. Payments of $97 50 and $195, respectively, are to be made to aero clubs and flying schools for each pilot trained, under the terms of new contracts entered into during the year These contracts provide total pay-

(Concluded on page 960)

Foreign Briefs

M Antoine, pilot on the French Aeropostale Toulouse-Casablanca-Dakar route, has received the highest award given by the French Committee of Aeronautical Propaganda for his record of over 45 000 mi of flight in a period of six months. Ten other pilots received prizes or honorable mention for a similar record over slightly smaller distances

Jean Mermoz, chief pilot for Aeropostale, is at St Louis, Senegal, ready to take off on an experimental 1,700-mi flight with mail to Natal, Brazil, in a Latecoere plane The company hopes soon to operate regular mail service by plane across the South Atlantic

Tests of a Morane-Saulnier plane powered with 130 hp Clerget Diesel engine are being conducted at Villacoublay. The Morane-Saulnier company, recently licensed to manufacture Moth planes in France, has already received 30 orders, The firm plans extensive development of its airport at Villacoublay An order for M-S 60 training planes has been received from Compagnie Francaise d'Aviation

Two airplanes are now in regular use by the Paris police force

Delegates from fourteen countries attended the recent conference on aviation lighting problems, held in Berlin

Miss Amy Johnson, recently licensed as a ground engineer as well as pilot, has started a solo flight from Croydon to Australia in her Moth plane

Pamba Antonio Ralli, chief technical engineer for Fairey Aviation Co, died unexpectedly at the age of 41 He had been with the company since 1916 and was associated with many famous designs, including the propellers used on last year's Schneider Cup race winners

Nydqvist & Holm-A B Trollhattan, Swedish manufacturers, have been commissioned by the Swedish Government to manufacture Bristol Jupiter engines under the license recently acquired from the English firm

Lord Hugh Trenchard, recently resigned as Air Chief Marshal of the Royal Air Force has been made a director of Goodyear Tire & Rubber Co of Great Britain, Ltd.

British airmen in India have been scattering propaganda leaflets as part of the effort to deal peaceably with the recent disturbances there

On April 21, Maj B, F S Baden-Powell completed 50 yr continuous membership of the Royal Aeronautical Society, of which he is an Honorary Fellow and past president

Gottlieb Espenlaub, who has been conducting experiments with a rocket plane in Germany, was slightly injured May 1 when a rocket exploded prematurely during a flight Fritz von Opel has recently announced that he plans an attempt to cross the English Channel in a rocket plane this summer, covering the distance in less than 15 min.

German aviation companies have presented a "necessity program" to the Government, calling for subsidies of about $2,160,000 for development of economical planes, $720,000 for purchase of planes, $312,000 for records and contests, $240,000 for development of touring, and $120,000 as a reserve fund. Special arrangements to encourage export are also asked

International Aircraft Ltd has been formed in London to sell Italian Breda planes using Gipsy engines in England.

The proposed flight of the R 100 to Canada has been delayed because of damage to the starboard elevator in removing the ship from its hangar

Siemens & Halske, Berlin, has developed a nine-cylinder radial engine developing 500/580 hp, weighing 880 lb.

A new airline, using Fokker trimotored planes is to be started between Poland and Roumania about July 1, with probable stops at Lwow, Czernowicz, Galatz Bucharest

This year's International Glider Meet will be held at Rhoen Aug 9 24 under the auspices of Rhoen-Rossitten Gesellschaft, using the Wasserkuppe terrain

Donald Mackay, N S W has chartered a new Lasconder plane built by Australian Aerial Services, Ltd for explorations in central Australia.

The State Council of the Chinese Nationalist Government has issued new regulations for the extension of the activities of the National Air Mail Bureau of the Ministry of Communications

The Chinese Ministry of War is developing an aviation institute to train pilots for both military and civil services.

The widow of Charles Clavier, wireless operator who was killed in the crash following Rene Fonck's attempt to fly the Atlantic, has lost a suit for damages against Fonck's backers, on the grounds that Clavier was engaged only for preliminary work and not to make the trip

Ceskomoravska factory has acquired the license to manufacture Isotta Fraschini engines in Czechoslovakia

Italian Aeronautical Association has organized a series of conferences for the interchange of scientific ideas and discoveries

D'Ascanio has been experimenting with a helicopter of his own invention at Rome

A memorandum issued by the British Air Ministry limits the aggregate annual subsidy for air transport to $4,-860,000, and provides that no subsidy agreement shall extend beyond Dec 31, 1940 Gross subsidies for 1930 will amount to about $2,000,000 and for 1931, to $2,700,000

Avions Caudron has secured a field and will open a flying school near Paris

Societe des Moteurs Salmson showed a net profit of $90,800 for the fiscal year recently ended, as compared with $73 200 the previous year.

Patent suits against the Ford Motor Co have been brought by the Junkers company in Berlin and in Czechoslovakia

K.N.I.L.M. to Cross India Again

THE HAGUE (HOLLAND)—Conditions upon which the British Government will permit resumption of K N I L M service to the Dutch East Indies by way of India next fall are as follows (1) Service will be stopped when landing fields are in bad condition due to heavy rainfall, (2) Landing grounds in the Dutch East Indies will be available for use by British pilots on the London-Australia service, (3) No passengers may be carried between points in India except en route to or from outside points (4) air mail to British India shall be delivered on the outward journey at Karachi, and on the return trip to a point to be designated in Burmah These conditions having been tentatively accepted by the Dutch government and K.N I L M service is scheduled to be resumed on October 1 this Fall

Australian Report

(Continued from page 96?)

ments not to exceed $5,850 per year.

The Air Estimates for 1929 30 for the Royal Australian Air Force call for an appropriation of about $2,160 000 Since there were in the R.A A F only 104 officers, 853 N C.O's and men and 62 planes when last reported the Auditor-General regarded this figure as considerably too high, and he also recommended that the number of men be reduced. Further, considerable expenses which had been made for special trips by R A A F officers and planes for the benefit of other Government departments were disapproved both because of the money involved and because they reduced the number of planes available for regular Air Force work

It was reported that in five years ended Jan 31, 1929, a total of about $610 000 had been spent on the Air Force Experimental Section at Randwick This included the cost of construction of two Widgeon and two Warrigal planes, none of which had been found to give satisfaction and all of which had cost from two to three times the amount of the original estimate As a consequence, orders for closing the station have been given and are now being carried out, though the second Warrigal plane is not yet completed according to the announcement

New line announced

Word has been received that in addition to the subsidized services operated last year, a new subsidized service between Camooweal and Daly Waters was inaugurated Feb 20 by Larkin Aircraft Supply Co., Ltd. It is also reported that Brisbane to Queensland Air Navigation, Ltd., would open a bi-weekly Brisbane-Townsville service, and a daily Townsville-Cairns service. The distance between Brisbane and Townsville is 728 mi and intermediate stops are to be made at Rockhampton and Mackay Avro X and Avro V planes will be used.

THE BUYER'S LOG BOOK

This Log is prepared by the editors of AVIATION purely as a service to readers All items are published free of charge, solely on their news value, and without any advertising consideration whatsoever. Manufacturers are invited to send in material for this section

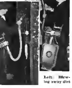
G. E. Novalux Beacon

The Novalux 20 in aviation beacon of the General Electric Company, Schenectady, N Y, is designed for use at airports and is usually mounted on an airport building of sufficient height that the beacon beam will clear adjacent dwellings. This beacon includes a 20 in, silvered glass, parabolic mirror which gathers and projects the light from a 1,000 watt Mazda lamp, an automatic lamp changer that places a new lamp in focus immediately upon failure of the lamp that is in operation, two slip rings with mettte brushes, a worm-and-gear mechanism, and an electric motor Directly in front and below the lamps are louvers that cut off objectionable stray light A flashing mechanism for operating on-course lights or code beacons is located in the base of the beacon. The standard speed of rotation is 6 r p m

All parts are fully enclosed by the heat resisting glass dome and fabricated metal base. Every part is accessible either through the doors in the base or by lifting the glass dome upon its hinge The operation of the beacon is not affected by snow or ice and, since there are no exposed parts, wind pressure cannot cause uneven operation The moving parts are, therefore, free from abnormal stresses

U. S. Vacuum Cleaner

A combination blower and vacuum cleaner is a recent product of the United States Electrical Tool Co This



Right: Used as a cleaner

Left: Blowing away dirt

tool picks up dust and other free dirt wherever the nozzle or brush can penetrate, and by the removal of the dust bag and a change in the location of the hose, it blows dust from the places hard to reach, such as inside motors, machines and switchboards Ease of handling is a special feature of this cleaner It comes in two sizes complete with hose, nozzle, brush, canvas bag and shoulder strap The No 1 size weighs 7½ lb and the No 2 size 9½ lb The body is aluminum and a Universal motor operates on alternating or direct current

Aircraft Radio Battery

Ray O Vac No 5963, a recent product of the French Battery Co, Madison, Wis., is a combination "B" and "C" battery for use on board airplanes It has the following voltage terminals —9 volts "C", —3 volts "C", —1½ volts "C", one common terminal for —"B" and +"C", +45 volts "B", and +135 volts "B". These terminals make the battery adaptable to both the RCA or the RFL radio beacon receivers The weight is only 8 lb 9 oz The dimensions are 5 in x 4 in x 8½ in., matching the dimensions of the exide storage battery which is commonly used to light the filaments of the tubes used in the radio beacon receiver Both batteries may therefore be put in a common battery box.

All voltage terminals on Ray-O Vac No 5963 are soldered to the zinc cans, giving firm anchorage and preventing loose terminals during service Rubber covered nuts prevent shorting of the battery in case it should touch the side of the airplane Lock washers on each screw terminal prevent loosening of connections The entire battery is impregnated with paraffin to prevent moisture effect.

Imperial Hi-Duty Coupling

To meet the need for a copper tube fitting that will stand the vibration encountered in gas, oil and air lines of airplanes, air compressors and such services The Imperial Brass Mfg Co, Chicago, Ill, has just announced its Hi-Duty sky service connection The Hi-Duty coupling consists of two parts, a nut with a grooved sleeve and a body The tubing is placed through the nut against the tube shoulder in the body On tightening, the sleeve is forced between the tube and the special shoulder of the body, the resultant pressure shearing the sleeve from the nut Further tightening forces the sleeve forward without twisting or scratching the tube and results in a liquid and gas tight joint which resists vibration Couplings are available in all standard sizes, based on the O.D. diameter of the tube

Trade Catalogs

▶ *Lockheed planes.* Lockheed division of the Detroit Aircraft Corporation recently published a colorful booklet illustrating the Lockheed Vega, Sirius and Air Express with some of their recent owners Tables of performance figures and operating costs are given

▶ *Floodlighting* Catalog 312, a recent 52-page publication of Crouse-Hinds Co deals with the subject of floodlights and industrial lighting units In addition to describing and illustrating various types of floodlights, the booklet contains illumination data of value in selecting the proper unit for a given service

▶ *Airport and airway lighting equipment* Crouse-Hinds' Catalog 311 describes the company's line of airport and airway lighting equipment, including supply parts Photographs and diagrams illustrate the various lights and installation data is also furnished in this booklet

G.E. Compound Pulleys

The General Electric Co., Schenectady, N. Y. has recently placed on the market a new design of pulleys for use in the control systems of aircraft The pulleys are made of compound known as "Textolite" molded to shape around Norma Hoffman ball bearings The bearings are of the single-row, self contained type, and the compound consists of selected sheets of linen impregnated with a phenol compound and molded under high pressure.

At present the manufacturer is standardizing on a pulley with an outside diameter of 3½ in made in accordance with specifications of the U. S. government The ball bearings have a ⅜-in bore designed to be mounted on steel pin or bolts in the aircraft The approximate weight of the pulley is 3½ oz

Gasket Compound

A new gasket compound called Nacotex has just been placed on the market by the National Cork Products Co, 355-359 Ogden Street, Newark, N J This product is used in the aeronautic field to provide a leakproof seal for housings, gas lines, oil lines and cooling systems It is neither a paste nor a cement, but possesses a very definite body which permits building up to offset surface irregularities For many unions, particularly where there are ground fit joints, it may be used without other forms of gaskets

WHAT OUR *Readers Say*

Pilot Responsibility

To the Editor

For a long period of time I have been reading with increasing respect your sound and logical editorials. For the first time, then, I wish to take exception to one of them.

I do not agree with your conclusion in the editorial of March 29, 1930, entitled Pilot Responsibility, that a pilot's decision to take off should be subject to the veto of "someone with long flying experience." In my humble opinion, such an arrangement is unnecessary, needlessly expensive, and detrimental to the esprit de corps of a company.

In the first place, it is unnecessary because a pilot will ordinarily have just as much experience as the type of dispatcher mentioned. Furthermore, if the dispatcher is such an able pilot and responsible person, why isn't he piloting the plane himself? To employ a capable pilot merely to veto, if necessary, another capable pilot is duplicating both work and authority.

Which brings us to the most important objection from the point of view of present day transport operation—that of a needles expenditure of money. In order to bring the system you advocate to a high point of efficiency, it would be necessary to have a dispatcher at every important stop along the route, who would be a pilot of long experience and have the authority and ability of an executive. Such a person would command an executive's salary, and the cost is obviously prohibitive. The other alternative—to use Mr. Brisbane's supermen who can run a business without knowing anything about it, is as obviously worthless as the other is expensive.

The third point, that of esprit de corps, needs very little comment. Its value has been protrayed in another editorial of yours in the same issue, and is universally recognized by the majority of business heads. To destroy a feeling of personal authority and close personal relationship with a company by subordination under a needless system, is to destroy what other industries are paying personnel men and psychologists to accomplish.

The pilot has always been placed, and has always placed himself, in a position similar to that of a ship's captain, and this is the position he should have. Once the plane has been turned over to him, his decision should be paramount. Elimination of incompetent pilots should proceed along the method of proper training, both elementary and as a co-pilot under a veteran plane commander.

Milton S. Turk,
Evanston, Ill.

[Mr. Turk's letter gives evidence of the diversity of opinion among aeronautical people on a subject of vital importance. He stands at one extreme. At the other are those who would make the pilot an automaton, with his every act directed from the ground. We ourselves are in an intermediate position. The pilot can neither be independent of ground control nor utterly subject to it.

The position of superintendent of operations on a division or at an important airport is an important one, suitable for a pilot to graduate into after long experience. From that position he should be able to check pilots and to guard against any over-optimism born of personal pride concerning ability to get through bad weather. The cost factor mentioned by Mr. Turk seems to us far less important than the increase in safety to be had by adopting the best possible organization and by assuring frequent check upon the fallible human element. But no one can check a pilot when he is in the air. There he must bear his own responsibility. The pilot of a present-day airplane on a regular air line stands in a position midway between that of the locomotive engineer and that of a liner captain. Perhaps he is nearer to the latter than the former, but no single analogy can be swallowed whole as Mr. Turk proposes in his closing paragraph.—Ed.]

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Behring Strait

To the Editor

I should like to supplement Ralph Wien's letter about the first crossing of Behring Strait by air. The Russian fliers on the Moscow New York flight crossed by way of Otter Island, from which our Army fliers left five years ago. It lies a few miles north of latitude 52 deg. N., while East Cape, Siberia, and Cape Prince of Wales, Alaska, which form Behring Strait, are a few miles north of latitude 66 deg. N. The distance between Otter Island and Behring Strait is thus about 950 miles across Behring Sea.

W. H. Sturtevant
Vice-president
Northern Air Transport, Inc.
Nome, Alaska

[The tendency to underestimate distances in some parts of the country far from one's own environment is universal, and we must apologize for having spoken too lightly of the distance between Behring Strait and the southern part of the Alaskan peninsula. The latitudes quoted by Mr. Sturtevant, however, are hardly indicative of the special difficulties of flight in the Aleutian group where fog and storm are far more frequent than the latitude deserves.—Ed.]

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The Human Factor

[It is with special pleasure that we publish the following letter from Gen. F. P. Lahm, in charge of all training activities for the Army Air Corps, commenting on "The Human Factor in Flying" by J. B. Culemans, published in Aviation for December 14, 1929. General Lahm, as most of our readers know, was himself among the earliest of the pioneers, having been a balloonist long before there was any such thing as military aviation and having taken airplane piloting instruction from the Wright brothers. Upon flight training and the qualities which determine the capacities of a pilot he speaks with peculiar authority.—Ed.]

To the Editor

This article discusses the human factor in flying and particularly in its application to safety in flying, the essential requisite in selling aerial transportation to the public. It is well recognized that accidents are generally due to errors of the pilot and these errors are traceable to over-confidence and over-zealousness as well as to lack of experience. Published figures give 63% of the accidents due to pilots' errors and 85% among pilots of less than two years' service.

After completion of flying training it is very important that the pilot maintain flying proficiency. The rate of occurrence of accidents of all kinds is approximately only half as great for pilots who fly 50 to 100 hours annually as for those who fly less than 50 hours, and the accident rate decreases steadily with further increase in annual flying. The rate of occurrence of accidents is greater during the first four hundred flying hours and decreased until the minimum is reached at twelve hundred hours and remains fairly constant thereafter provided, of course, that the proper flying proficiency is maintained.

Of course, the accidents should decrease as facilities are improved. Better airways, which mean more emergency fields, better meteorological service, and particularly, better transmission of meteorological reports, radio beacons, fog flying instruments and instruction in fog flying, are some of the means which should materially decrease the type of accidents that seem too numerous in commercial aerial transportation. With frequent emergency landing fields available the pilot will not be so inclined to take chance

and "bull" his way through as he is likely to do now in his eagerness to maintain a higher percentage of completed "trips" and in his natural aversion to putting his plane down in sparsely settled country with no source of information on weather conditions even after he lands. With fog flying instruments and skill in fog flying, which is one of the recent and very necessary developments in air transportation, and with radio equipped planes for receiving meteorological weather reports, the pilot will frequently be able to continue on his way with confidence, knowing he is on his course and knowing conditions ahead.

But the personal equation of the pilot or human factor will always be of prime importance.

A study of this human factor is the continuing duty of the flying instructor. He finds not only the open mind, eager and amenable, the restless over-weening ambition, harmless in its idiosyncrasies, and dangerous tendencies, but he must recognize these and base the student's instruction thereon. Briefly stated, he will run into the cocky pilot at the one extreme who must be repressed, and the timid pilot at the other extreme who must be handled with gloves, with all the varying degrees of these factors in between. This means that the instructor himself must be somewhat of a psychologist, and this we impress upon them in the Air Corps Training Center. The student initially learns from his instructor by imitation, thereby building up the necessary reflexes. After these reflexes are fairly well established, a large number of standardized maneuvers are given to develop the judgment of the students so that the correct reaction will be made unconsciously. Experience has shown that a standardization of maneuvers and methods of instruction have greatly increased the efficiency of our flying schools. With this in view, we conduct an instructors' school where the new instructors are shown standardization of maneuvers and methods of instruction, and the psychological factor is impressed upon them to familiarize them with the fact that while students have certain common characteristics, they are likely to be differently combined in each student.

Even then we sometimes find that the personality of the instructor and the personality of the student clash to the detriment of instruction. Change of instructors is made in those cases either on the request of the student if he feels it will benefit him, or, frequently, on the request of the instructor himself who feels that the student can do better under a different instructor.

Flying instruction is grueling work. Therefore, where it is carried on continually as in the Air Corps Training Center we prefer to have young men, comparatively recent graduates of the Air Corps Training Center but who have had some experience in tactical units where they have not only acquired broader professional knowledge but have perfected their flying by hours of experience. The young instructor does not "burn out" as quickly as the older man but there is a definite limit in this respect even for the younger man.

Fear is another major factor. Many students have difficulty in distinguishing between and overcoming that type of fear that warps judgment and prevents the correct reaction and that type of fear which is the result of clear headwork and judgment and dissuades from taking unnecessary chances. Many accidents are due to the attitude of mind into which all students are likely to fall after a certain period of instruction, the attitude in which they feel they can do anything with an airplane. This leads to their attempting maneuvers which are beyond the limits of the plane, or more often, beyond their own limitations.

It is especially true that "habit is not always and necessarily a test of present intelligence." We find frequently among our students a class which we call "mechanical pilots," men who under ordinary conditions do the right thing at the right time, but under stress, fail. The mechanical pilot is not desirable. We therefore grade every student each day not only on his technique, which may be mechanical, but on his headwork and judgment. This is continually tested throughout his course of instruction by cutting the motor and requiring him to make a forced landing, first under favorable conditions, and later under unfavorable conditions. Other means are used to test these same qualities and the student who is lacking in headwork and judgment is not desirable. He may fly for hours and hours without an accident, but in the "pinch" he is the one who fails.

"Youth and experience are required in a pilot" and these factors are conflicting. The flexibility of mind and muscle of youth is distinctly in his favor but experience teaches him much that is of value when he comes to qualifying as a pilot. It is interesting to find that the most favorable ages for successfully completing the course at the Air Corps Training Center are from twenty-two to twenty-six, with the maximum half-way between.

Frank P. Lahm
Brigadier General, A. C.,
U. S. Army

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Comment on Mr. Stout's Article

To the Editor

Mr. Stout says, in Aviation for April 5, "This article is intended to stir up discussion." Here is my contribution.

Mr. Stout wants a plane that will fit the public, especially the private owner. I agree that planes can and should be built which are much easier and relatively safer to fly. I believe that planes could be produced with a two-control system instead of the conventional three controls, provided pilots would agree to variation of flying technique, and pilots, as a body, will never agree to a variation of anything.

I believe that safer airplanes can be built but I do not believe the much discussed fool-proof airplane will ever be with us. Practically all attempts at safety follow the lines of obtaining high lift and slow landing speed for a given surface. By these means we reduce forward speed and gain vertical speed which leaves us practically where we started. The only valuable achievement, that of variable surface, seems a long way from us.

I believe the type of crash following loss of control will be avoided relatively easily, which will still leave us with the risk due to the speed of flight, but I think this still leaves the airplane a lot safer than the world's most deadly vehicle, the motor car.

I disagree with Mr. Stout that the small experimenter in a barn is going to get us far these days. By now the disposable load of any respectable aircraft should equal its empty weight and most planes are far from this. Such results will only be obtained by long and expensive experimenting for which the small man has little opportunity. This question of structural weight is at the bottom of the whole question of aircraft expense.

I agree with Mr. Stout 200% on the question of visibility. I have survived sixteen years of intensive flying by being respectfully frightened of airplanes, but nothing frightens me quite so much as having my forward view blocked by a big body and motor or dirty glass window. Yet our most important pilots, the mail pilots, insist on sitting blindly behind for the case of a crash which they might avoid if they could see better.

Mr. Stout makes no mention of the main problem. When we have these ships which are safe, easy and cheap to fly and sell, how are we going to operate them? At present an airplane is useful when the weather allows it to be. Until that is altered, the traveler is going to stick to the more dangerous but more certain motor car. And assuming correctly that we can make a plane easy to fly indefinitely through fog and cloud, how are we going to stop our private pilot from hitting the other fellow? This, of course, is a complicated question of radio navigation and the biggest problem of all is how we are going to connect this up with the private pilot.

F. T. Courtney,
Curtis-Wright Corporation
New York City

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Mr. Stout's Story and His Sketch

To the Editor

I wish to commend you for the integrity, honesty and fearlessness shown by publication of such articles

as appeared in AVIATION, issue of March 15, written by Anthony Hazard who said "The embryo American Airman is not afraid of himself and his own ability, *he is afraid of the machines given him to fly*", and the article by W B Stout, in AVIATION, issue of April 5, who said "And *Now* Let's Get Down To Work," expressing therein too many truths to be quoted within the scope of a letter, but which everyone seriously interested in aeronautics, should read—and re read.

It should seem unnecessary to commend an editor for the publication of truths, but the editor of a trade magazine who publishes articles expressing opinions at variance with the *statu quo* as practiced by his advertisers, is a genius so *rare*, as to warrant us to "page Diogenes," and every other seeker after Honesty and "Truth Regardless."

Mr Stout's article enumerates a number of features that *should* be standards of future 'planes, which enumeration constitutes—by implication—positive indictments against present 'planes which do not embody said fundamentally sane and desirable features I would point out a weakness in his arguments, however, wherein he places emphasis on the value of "Appearance," and illustrates "Any freak arrangement of good units is worth trying," representing a Canard type or tail-less airplane "easy to look at," but which embodies a number of obviously faulty aerodynamic features which evidence his unfamiliarity with Canard principles, and which might prompt manufacturers to materialize said actual design, and thus court failure, and perpetuate prejudice against the Canard principle

I speak now as a specialist in Canard design, and wish to warn Mr. Stout and other *soi disant* designers of such machines, that the mere employment of a front-elevator—in lieu of a tail—does *not* insure success or guarantee those special features of inherent-stability which—one day now near at hand—shall establish the Canard-type "ship" as the *only* type fit to be flown by the average man Disregard of this single fact alone, has given the Canard-type ship a black-eye, since its origin, in 1903 So, although Mr Stout has drawn a pretty picture, the machine, as a true Canard—simply wouldn't work. It would *fly*, but so do all conventional headless-type airplanes, and "just flying," one should remember, is the curse of aviation today

To conclude (in repeated eulogy of your Editorial Policy and of Mr Stout's intention) what the world needs, today, is *safe* flying,—and this is *not* obtainable with "extra-maneuverable-type" airplanes

I would say to Mr Stout More power to your good write-arm, in calling attention to the *vital* needs of aviation—but, refrain from pictorial suggestions that can only lead to disasters equal to what we suffer today

JOSEPH BLONDIN,
Los Angeles, Calif

Abstracts AND *Reviews*

Los Angeles Flight Tests (1)

FLIGHT TESTS ON U. S. S. LOS ANGELES, *Part I Full Scale Pressure Distribution Investigation, By S J DeFrance, N A C A. Technical Report No 324*

THE BUREAU OF AERONAUTICS Navy Department, recently instituted a series of tests on the Navy's dirigible, the "Los Angeles," in order to gain knowledge of the aerodynamic loads acting on it, and the resulting stresses in its structure The Bureau had the cooperation of the National Advisory Committee for Aeronautics in this work, the latter obtaining the aerodynamic load distribution while the former measured the stresses in certain structural members All the data obtained by both agencies were taken simultaneously and the records were synchronized This report deals only with the work of the National Advisory Committee, the stress measurements being reported in No 326

Previous measurements of the full-scale loads acting on airships have been so limited in scope as to be of little value For these investigations small orifices were secured to the outer cover, flush with the surface, at various points along the forward quarter of a main longitudinal member, and girdling the ship's hull at frames Nos 145 and 175, the latter being the fourth from the nose, while the former is at about a fourth of the total length from the nose. In each of the circular rows four orifices were located between longitudinals 2 and 2½ to determine the effect of the polygonal shape upon the pressure distribution Orifices were also located inside of the hull at various points for the purpose of measuring the fabric loading. Orifices were secured to the opposite sides of the lower fin and rudder at 41 stations, and to the opposite sides of the starboard fin and elevator at 42 stations. Additional orifices were fastened to the upper and port fins to obtain pressures for checking purposes. To determine the fin effect of the passenger car, five orifices were secured to each side of this body at various points along its length Thus, pressure measurements were made at 95 points on the tail surfaces, 54 on the forward portion of the hull, and 5 on the passenger car

The pressures were measured by multiple recording manometers connected with the orifices by means of aluminum tubing. For the hull, the external pressures normal to the surface were measured relative to that within the keel, which in turn was measured relative to the static pressure as obtained by a static head suspended 30 feet below the ship at frame 165 Readings of the latter were erratic, however, due to being in a disturbed area caused by the passenger car Consequently the pressures acting on the hull could be measured accurately only with respect to the keel pressure

In addition to measuring the pressures on the control surfaces, other instruments were installed to allow determination of the complete turning characteristics of the ship These instruments were a recording altimeter and air speed meter a recording "turnmeter" for measuring angular velocity in pitch or yaw, a control position recorder a "yawmeter" for measuring the angle of yaw an inclinometer, and a chronometric timer for synchronizing all readings As another source of information regarding turns, a camera obscura was located on top the dirigible hangar and operated upon radio signal from the airship

The tests were divided into two parts, those conducted in smooth air and those in rough air No vertical maneuvers were attempted, due to the necessity of conserving helium The horizontal maneuvers consisted of steady turns, and reversed turns, at various engine R P M s Deceleration runs were also made in order to determine the time required to halt the ship with the propeller stopped, and with the propellers disengaged and idling.

The results were given in the form of tables and charts For the tail surfaces a coefficient of the normal force was derived $C_{NF} = 2F/S\rho V^2$, where F is the total load, ρ is the air density at time of tests, S is the area of the surfaces, and V is the true velocity The total load was obtained by plotting the pressures upon drawings of the surfaces and integrating the curves

No horizontal movements in still air gave a load on the tail surfaces approaching the design load, but in gusty air of a little less than squall proportions the design load was exceeded for the horizontal surfaces but not for both the horizontal and vertical simultaneously The "Los Angeles" was designed to withstand a force equivalent to a normal force coefficient of 0 34 simultaneously on both sets of tail surfaces. On one run the normal force coefficient for the horizontal surfaces was 0 349 but that for the vertical surfaces at the same instant was only 0 126 Evidently the greatest effect of the gusts was in a vertical direction.

No excessive loadings were obtained on the hull structure during the maneuvers in either rough or smooth air The total transverse force on the passenger car was at all times small indicating that that body had a negligible fin effect.

Results of the measurements of fabric loads indicated as maximum pressure of 6 6 pounds per square foot on a fin, which was far from excessive.

Turning characteristics could be determined only from the camera obscura data as the turnmeter gave inconsistent readings The results were not given in this report, however, nor were the results of the decelerations tests, both being saved for subsequent reports

These pressure distribution tests indicate that loads considerably in excess of those for which the airship was designed would probably be obtained if the machine were flown through a line squall

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Los Angeles Flight Tests (2)

FLIGHT TESTS ON U S S LOS ANGELES, *Part II Stress and Strength Determination, By C P Burgess, N A C A Technical Report No 325*

REPORT No 324 gives the results of an investigation to determine the pressure distribution on the hull, tail surfaces, and passenger car of the U S Navy's dirigible, the "Los Angeles" Simultaneous with these tests, the Bureau of Aeronautics Navy Department conducted a study of the stresses resulting from the measured aerodynamic forces

Electric telemeter strain gages were placed at various points on the hull and connected with automatic recording instruments centrally located The gages were of the carbon pile type developed by the Bureau of Standards Their precision was not particularly good, errors of possibly 25% occurring due to backlash and hysteresis and a tendency of the carbon piles to gradually change their resistances

The records from the gages installed in the forepart of the hull indicated that the transverse forces on the airship's forebody were small and irregular Much greater forces and strains would probably have been recorded on the forebody if the airship had been flown at the angles of pitch required to offset large inequalities of weight and buoyancy

The gages installed on the longitudinal members at the top of the keel and the lower part of the hull indicated stresses of the same sign and approximately equal magnitudes for both members when subjected to vertical bending moments, thus showing that the keel acted as an integral part of the hull rather than as a separate beam

As a means of comparing the bending moments derived from the strain gages, with the tail surface forces and theoretically derived bending moment coefficients, a nondimensional coefficient was derived $C_M = M/qV^{2/3}L$, where C_M is the coefficient of aerodynamic bending moment, M is the aerodynamic bending moment, q is $\frac{1}{2}\rho V^2$, V is the air volume of the airship, and L is its over-all length. For the "Los Angeles" the C_M was $M/4\,000{,}000\ q$. It has been accepted practice to design rigid airships, including the "Los Angeles," for a maximum aerodynamic C_M of about 0 01 at the airship's full speed, plus a material factor of safety of 2.0 to 2.5 The observations in rough air indicated that the strength of the "Los Angeles" is sufficient to withstand severe gusts, but there is not much margin for hitting a violent and sharply defined wind squall at high speed. More recent practice provides sufficient strength for a maximum C_M of about 0 02

Since the pressure distribution measurements showed the transverse forces on the hull to be small, it was inferred that the aerodynamic bending moments were largely the result of tail surface forces opposed by the inertia of the hull against angular acceleration. This conclusion was confirmed by the insignificant strains shown by the strain gage records when the airship had settled to the condition of steady turning Unfortunately, the turn indicator carried on the ship proved to be unsatisfactory so that the angular acceleration could not be determined accurately Future investigations should be devoted to measuring this quantity, particularly in rough air.

New Patents

Retractible Landing Gear

1,747,593 PONTOON FOR AIRPLANES JOSEPH G YONKESE, Corregidor P I Filed Aug 21, 1922 Serial No 583,266. 19 Claims. (Cl. 244—2.)

A PONTOON filled with air or cork is formed with a central channel running throughout its length. The channel is subdivided into recesses in each of which is pivotally supported a landing wheel designed to be drawn into the recess for alighting on water, or to be swung below the pontoon for alighting on land The pilot is provided with a handle for controlling the position of the wheels through gearing, and shutters operated by the same handle are provided for closing the recesses when the wheels are withdrawn and opening the recesses when the wheels are extended The shutter has openings for permitting water to escape and air valves are designed to prevent formation of a vacuum in the recesses

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Retractible Landing Gear

1,747,656 RETRACTIBLE WHEEL FOR THE PONTOONS OF AMPHIBIAN AIRPLANES VINCENT J BURNELLI, New York, N Y assignor to the Uppercu-Burnelli Corporation a Corporation of Delaware Filed Nov 3, 1927, Serial No 230 644 2 Claims (Cl 244—2)

THE WHEELS are mounted in channels midway of the pontoon length The shaft of each wheel is mounted in bearings which are slidable in guide blocks for raising and lowering the wheels The movement of the bearings in the guide blocks is designed to be effected by the pilot operating a cable extending over the upper end of a pulley which operates a chain and sprocket-wheels These wheels rotate nuts on threaded stems connected to the bearings, and the nuts are held against linear movement so that their rotation will move the stems and the bearings up or down Shutters are provided for closing the openings in the bottom of the pontoons after the wheels are retracted

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Airplane Engine Cooling System

1,747,695 AIRPLANE VINCENT J BURNELLI, New York, N Y assignor to The Uppercu-Burnelli Corporation, a Corporation of Delaware. Filed May 7, 1927, Serial No 189 589 2 Claims. (Cl 244—31)

A COOLING SYSTEM for the Remington-Burnelli type of airplane having two engines in the nose-portion Two radiators are positioned between the engines so that air will be furnished by the propellers and the speed of the craft The radiators are of the honeycomb type designed to permit the air to pass through it and into passages enclosing the engines These passages discharge through openings in the side of the craft and it is stated that the speed of the craft will create suction to assist in discharging the air from the passages after cooling the engines

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Tail Structure for Aircraft

1,747,565 EMPENNAGE STRUCTURE FOR AIRCRAFT JOSEPH G. YONKESE, Brooklyn N Y Original application filed May 14 1925 Serial No 30,135 Divided and this application filed May 31 1927 Serial No 195,439½ 19 Claims. (Cl 244—29)

A COMBINED LAND and water plane of the type having two cabins or bodies is provided with a rigid tail structure including two horizontal stabilizing wings reinforced by vertical struts. At the rear end of each stabilizing wing is pivoted an elevator, and in the space between the wings are pivoted the rudders Cable and pulley connections from the front end of the cabins are intended to permit simultaneous operation of both elevators or both rudders

SIDE SLIPS

By
Robert R. Osborn

LATELY there seems to be a regular flood of magazines on the market specializing in air stories. As they are sure to be popular with the younger generation and are profusely illustrated we think the Department of Commerce had better get busy and pass regulations prohibiting most of the stunts and maneuvers pictured therein. One flaming red cover we saw recently portrayed an aviator clinging to the fin of an airplane with one hand, clutching his unconscious buddy with another hand and firing a revolver at the enemy with a third hand. Another far more romantic and artistic cover showed the villian and hero fighting over a beautiful damsel, all three being perched on the extreme wing tip of a Jenny. One of the magazines had an illustration which will probably have a serious effect on the *Literary Digest* poll, as it showed an aerial bootlegger gang being captured by a lone state trooper diving on them in a Martin bomber. The bootlegger gang must have been an accomplished group too, and can be assured of good jobs on any airline if they ever go straight, as they were able to load about five men and numerous cases of likker in a clipped-wing Canuck. We would be able to mention a lot of other choice bits too, but just as we finished that one the paper store proprietor tactfully suggested that we buy one of the magazines if we wished to read it. We didn't even have time to satisfy our curiosity as to whether or not they were all published in California.

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Mr. F.H. of Ponca City, Okla., speaks up on our side in the discussion of the astounding things that happen aeronautically in California. He encloses a clipping about a parachute jumper from the Los Angeles *Express*, calling our attention to the following statement:

"The highest speed that a human body can reach is approximately 400 m.p.h.," Hunter stated. "In my record jump I was traveling 384 miles per hour when I pulled the cord."

The only explanation we can offer, Mr. F.H., is that in California the parachute jumpers must be fitted with outboard motors and do their work in full throttle dives.

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Mr. W.S.Z. of Oil City, Pa., writes in to say that in view of our recent exposure of aeronautical conditions in California, he was not surprised to receive a telegram from a friend out there telling about the development of a new "radical" engine.

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Mr. H.P. of New York detects signs of air-mindedness on the society page of the New York *Evening Post* in a recent issue:

"Dr. Eckener came from his home in Germany especially for the presentation of the medal. He was accompanied by Frau Eckener and by their son, Herr Knut Eckener. The lad made the famous cruise with his father and won considerable fame for himself *by crawling out on the struts to mend a broken aileron.*"

You can imagine the predicament—meanwhile the dirigible was entirely without lateral control!

• • •

Mr. W.D.W. of Los Angeles, Cal., has loaned us a choice bit from his very much prized collection of "nut" correspondence or, shall we say, "lighter - than - air - minded" correspondence.

"Dear Sir:—I would like to buy an airplane will you tell me the address of firms where I can have one made like I want. I would like to ask Mr. Lindbergh (Col. Charles A. Lindbergh) about a part I want put in, can you tell me his address if not there please tell me where I can write him."

"Dear Sir:—Undoubtedly you are not aware of the fact that Colonel Lindbergh is a very busy man and cannot possibly give any of his time and attention to talking over various people's ideas of aviation appliances, of which there are thousands in this country. I would suggest that you subscribe to one of the trade magazines and from their columns secure the information you need regarding the purchase of a plane. Some of the magazines also have question and answer columns which you can perhaps use to your advantage in securing the information you wish about your idea."

"Dear Sir:—I rec'd your curt letter was glad to hear from you and of course I know Col. Lindbergh was a very busy person. but he would not be very busy if no one ever spoke to him would he. haven't I as much right to write to him as you have to talk to him, I have never seen him even, and I have some important business I wanted to write to him about you could have been kind enough to give me his address and if he is too busy to anw it, it would be all right with me. And I didn't think I had to tell you just what I wanted to write him or does just real rich people the only ones that can write or see him."

"Dear Sir:—I am sorry that you felt that my recent letter was curt. I certainly didn't mean to be curt, nor to hurt your feelings, but merely desired to give you the facts concerning Colonel Lindbergh as I see them in hopes that you would not feel disappointed if you received no reply to any communications which you might address to him. I believe a letter addressed to him in care of T.A.T. Maddux, Glendale, Calif., might have a chance of reaching him while he is in Southern California. You are all wrong when you imply that just real rich people are the only ones that can write or talk to Col. Lindbergh. I know lots of real rich people that try awfully hard to see Col. Lindbergh and the fact that they are real rich doesn't get them anywhere with him. Now in my case, I am real poor, as you probably are, and once in a while he will talk with me maybe for five minutes if he hasn't something more important to do. I hope that this may really be of a help to you in solving your problems as we poor people have to stand together."

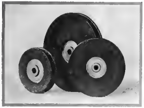
• • •

We think Mr. W.D.W. would have saved a lot of trouble by simply telling the gentleman to go ahead and put his gadget in the airplane he proposes to buy. No harm could come of it, for, like all other gadgets, it would rattle loose and fall off in two or three hour's flying.

Micarta

Control-wire Pulleys

... *with* BALL BEARINGS



Ball-bearing Micarta control-wire pulleys

UNEXCELLED for strength, durability and low friction losses, these Micarta pulleys are equipped with ball bearings having dustproof shields. The bearings are packed with grease before assembly and, therefore, require no further lubrication during the life of the pulley. The only precaution necessary in their use is to see that they are not exposed to dust from the slipstream and dirt from the landing gear.

Micarta pulleys may also be obtained with graphite bearings. They are light in weight, strong, and will not warp, split, splinter, or develop flat spots.

Other Micarta aviation products include fairleads, hinge bearings, propellers, and cabin lining.

For complete information, write to the nearest Westinghouse sales office.

Service, prompt and efficient, by a coast-to-coast chain of well-equipped shops

Westinghouse

T-31179

PITCAIRN SPORT MAILWING

Three place (two passengers and pilot), dual control Top speed 145 m.p.h Cruising speed 125 m.p.h. Wright Whirlwind J-6 225 H.P. Engine All night flying instruments Price fly-away factory, $8000.

On Time

On a quick call to business at some distant point . . . with a late start to join your friends at play a hundred miles or more away, your Pitcairn Sport Mailwing will take you and bring you back on time Will carry you in comfort and give you so keen a sense of pleasure in the flight itself that the value from your work or relaxation is heightened beyond measure.

The Pitcairn Sport Mailwing, sister ship to the veteran Mailwing mail plane, shows its heritage six million air miles flown by day and night, flown in fair or bad weather . . . setting an amazing record of swift, true flying where "on time" is the essential MUST.

Pitcairn owners from New York to California chose their Sport Mailwing first perhaps for its soundness, its staunch dependability; and then of course for the truly wonderful degree of inherent stability, another happy heritage from the mail ship . . . but then certainly also for the clean beauty of its line, its great comfort and its rich finish.

PITCAIRN AIRCRAFT, INC.

PITCAIRN FIELD + WILLOW GROVE + PENNSYLVANIA

SPORT > > > > BUSINESS > > > > AIR MAIL

This is one of a series of advertisements directed originally to advertising men in an effort to make industrial advertising more profitable to buyer and seller It is printed in these pages as an indication to readers that McGraw-Hill publishing standards mean advertising effectiveness as well as editorial virility

Of course,
this doesn't happen every day

Recently in Erie, Pa., a McGraw-Hill circulation man visited a plant to get subscriptions and got the surprise of his life. The story may be interesting to those advertising men, who, in selecting advertising mediums, consider not only reader interest but how circulation is built.

Frankly, this Erie plant was not covered as a unit* by certain McGraw-Hill publications. The circulation man was there to find out why. In keeping with McGraw-Hill policy he called at the front office, learned the plant set-up and obtained permission to interview key men.

When, finally, he reported back to the front office the surprise came. Unknown to him an executive had watched him work. This executive greeted him somewhat like this:

"So this is the way McGraw-Hill builds circulation! It interests me because you see we are advertising in your *Engineering News-Record*. We are now going after some mining business and your demonstration here convinces me that your *Coal Age* is a good place for us to advertise."

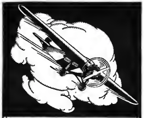
McGraw-Hill circulation headquarters in New York will gladly explain its principles and practices of circulation building to those who are interested.

* *Unit Coverage is the aim of McGraw-Hill publications It means covering the key men of each department or function with the right publication.*

McGRAW-HILL PUBLICATIONS

New York Chicago Cleveland Detroit Philadelphia St. Louis
Greenville San Francisco Boston London

F 81



Our wide experience

in the field of

AUTOMOTIVE ENGINES

makes us a most practical source for

AIRPLANE SPRINGS

on a production or experimental basis

Two Plants for Spring Service

BGR

COOK SPRING CO. DIVISION
OF BARNES-GIBSON-RAYMOND INC
ANN ARBOR, MICHIGAN
DETROIT DIVISION 6400 MILLER AVE., DETROIT

Where the factor of safety is all important . . . .

Through Death Valley, across the Bad Lands, the Rockies, or scorching desert sands, the reliability of Zapon products continues supreme. Since the beginning of aviation they have contributed largely as an all important factor of safety. In

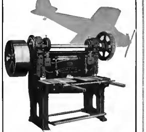
Clear Nitrate Aeroplane Dopes
Semi Pigmented Aeroplane Dopes
Gloss Pigmented Aeroplane Dopes

the element of safety is constantly assured by the most exacting series of continuous laboratory tests, each step vitally essential to maintaining not only the highest standard of Zapon quality but also absolute safety in the air.

Also Thinners, Lacquer Enamels
and Lacquer Primers

It is the age of color even for the plane and in keeping with this modern desire Zapon Cloth for interior upholstery lends an ultra luxurious finish to the finest sport job Brilliant in color, attractive in pattern, its durability is such as to "wear and wear and wear"

THE ZAPON COMPANY
STAMFORD, CONN.



POWER SQUARING SHEARS

Pexto Power Squaring Shears are the Universal favorite with all metal aircraft builders everywhere

Get the story from our Bulletin No. 10 Write for your copy "Machines and Tools for Sheet Metal Work."

PEXTO

The Peck, Stow & Wilcox Co., Southington, Conn., U. S. A.

Business Wants

THE *Searchlight* Section of this paper represents a meeting place for men and concerns who have immediate business "wants" to fill—the section covers

Agencies Wanted	New Industries Wanted
Agents Wanted	Office Space for Rent or Wanted
Books and Periodicals	Partners Wanted
Business Opportunities	Patent Attorneys
Civil Service Opportunities	Patents for Sale
Contracts Wanted	Plants for Sale
Desk Room for Rent or Wanted	Positions Vacant
Educational	Positions Wanted
Employment Agencies	Property for Sale
Employment Service	Representatives Wanted
Foreign Business	Salesmen Available
For Exchange	Salesmen Wanted
For Rent	Spare Time Work Wanted
For Sale	Sub Contracts Wanted
Franchises	Tutoring
Labor Bureaus	Vacation Work Wanted
Miscellaneous Wants	Work Wanted

"SEARCHLIGHT"

Angle Steel Equipment

for Factory, Shop and Office

Angle and Sheet Steel

Stools — Chairs — Desks — Bench Legs — Tables — Benches — Cabinets — Trucks — Machine Tenders — Bins — Pans.

Write for Catalog "C-AV" on your letterhead

Agents and Dealers in Principal Cities

Angle Steel Stool Co. Plainwell, Mich.

Send for Catalog

SEAPLANE FLOATS

FLYING BOAT HULLS

SEYMOUR J. BAUM, Inc.
268-288 Albion Street Elmhurst, L. I.

Brass and Copper

Immediate delivery from
18 convenient warehouses

CHASE BRASS & COPPER CO.—Incorporated—
Waterbury, Conn.

AEROL

Shock Absorbing Landing Struts

No other part of an airplane is built with more care, precision and finer materials than our Aerol Landing Struts. Built by The Cleveland Pneumatic Tool Company, Cleveland, Ohio. ¶ The Company also offers a complete line of fine air-operated hammers, drills and accessories

AEROL shock absorbing STRUT

WHERE TO FLY

CALIFORNIA

FLORIDA

HOCH FLYING SCHOOLS

Latest type training planes used. Instructors Licensed by Dept. of Commerce. Courses Licensed. Write for literature.

Latest Methods of Instruction

Northern Division BUTLER, PA.
Southern Division FLAGLER BEACH, FLA.

ILLINOIS

Eagle Airways, Hinckley Illinois, formerly Eagle Airport School of Aviation 45 miles West of Chicago. Learn to fly at our new location on the Transcontinental Airway DeKalb County Airport, equipped for night flying. Transport Pilots, modern equipment, reasonable rates, excellent accommodations. Distributors for Simplex Monoplanes, Air Kings and Monocoupes. Write for free information.

EAGLE AIRWAYS, INC.
Hinckley Illinois

LOUISIANA

Wedell-Williams Flying Schools

New Orleans, Patterson, Shreveport, Louisiana

YEAR ROUND FLYING WEATHER

Complete Flight and Ground School Training

WEDELL-WILLIAMS AIR SERVICE, INC.
Whitney Bldg. New Orleans

MICHIGAN

Skyways are Easy Highways—Our Way! Flying Business and Mechanical Courses thoroughly taught by the

BATTLE CREEK FLYING SCHOOL, INC.

Battle Creek, Michigan

Personnel and Equipment in accordance with Department of Commerce Regulations. Write for particulars on our payment plan

MISSOURI

UNIVERSAL AVIATION SCHOOLS

A National System of Government Approved Aviation Schools

Universal Flying School	Cleveland, Ohio
Universal Flying School	Memphis, Tenn.
Universal Flying School	Minneapolis, Minn.
Universal Flying School	St. Louis, Mo.
Universal Flying School	St. Paul, Minn.
Universal Flying School	Kansas City, Kansas

UNIVERSAL AVIATION SCHOOLS

Headquarters

1012-1016 Boatmen's Bank Bldg. St. Louis, Mo.

NEW HAMPSHIRE

LEARN TO FLY AT THE FOGG FLYING SCHOOL

Concord Airport, New Hampshire. Courses for all classes of licenses given in new planes under instructors with over 4,000 hours each to their credit.

NEWHAMCO AIR SERVICE
Concord, New Hampshire

NEBRASKA

Learn AVIATION
WHERE LINDBERGH STARTED!

GET TRAINING THAT ASSURES SUCCESS!

Come to Lincoln—one of the largest, best-known and finest-equipped civilian air schools in the U. S. We trained Lindbergh (our FREE Literature tells the story). Prepare you for a pilot commercial or transport license. Complete practical courses in airplane building and mechanics. Instructors and training planes carry U. S. Dept. of Commerce licenses. Write for FREE Literature today

LINCOLN AIRPLANE SCHOOL
741 Aircraft Bldg. Lincoln, Nebr.

NEW JERSEY

GET A FLYING START AT
AIRVIEW FLYING SERVICE, Inc.

Learn to fly at finest Airport on Jersey Coast

Distributors for Waco	Agents for Fairchild
Aeromarine-Klemm	Curtiss Products

Taxi Service — Photography — Service and Repairs — Hangar Space — 1 hour from New York City

Write for details

Phone Red Bank 1730
Red Bank, N. J.

NEW YORK STATE

FLY NOW
AVIATION TRAINING

U. S. GOV APPROVED SCHOOL

AGENTS FOR Waco Stinson Loening Fleet Travelair

D. W. FLYING SERVICE
LE ROY, N. Y.

YOU FLY DAILY AT OUR OWN HUGE AIRPORT

Ground and Flight Instruction on New, Modern Equipment.

Open and Closed Ships.

Hayes Flying School

FLYING COURSES

$245, $395, $995

Write for Information

230 W. Genesee St. Syracuse N. Y.

The fact that schools advertising in the WHERE TO FLY section of AVIATION have done so over a period of years is one of the best testimonials to the efficiency of this type of advertising.

NEW YORK STATE

ALBANY AIRPORT — FLY FOR SPORT OR PROFIT — ALBANY, N. Y.

COMPLETE GROUND and FLYING SCHOOL
Closed—Open PLANES

DUAL
10 Hours $200
20 Hours Private Course $390
50 Hours L. C. Course $950
SOLO @ $15 per Hour

FORD TRI-MOTORS Charter trips at Low rates.

Distributors: Monocoupe Monoprep Monocoach

MOHAWK AIRWAYS
BASE OPERATORS
ALBANY AIRPORT
ALBANY, N. Y.

ROOSEVELT AVIATION SCHOOL

Take off on your flying career where Lindbergh, Chamberlin and Byrd took off

Write, call or telephone.

118 West 57th St., New York City	Roosevelt Field Mineola, L. I., N. Y.

Highest Department of Commerce Rating

Master the Air WITH CURTISS-WRIGHT

Let Aviation's greatest organization train you—from fundamentals to complete mastery. Hundreds are enrolled at the 40 Curtiss-Wright Flying schools. Write for details.

CURTISS-WRIGHT FLYING SERVICE
"World's Oldest Flying Organization"
27 W. 57th St., New York

OKLAHOMA

U. S. DEPT. OF COMMERCE APPROVED TRANSPORT GROUND & FLYING SCHOOL

CATALOGUE ON REQUEST

SPARTAN SCHOOL OF AERONAUTICS
TULSA OKLA.

PENNSYLVANIA

PITCAIRN AVIATION of Pennsylvania, Inc.

10-, 20- and 50-Hour Flying Courses leading to Federal licenses conducted at Pitcairn Field, Willow Grove, Pa., one of the largest in the East, in midst of ideal flying country. All-year-round school. Modern flying equipment. No liability bond required. Write for Illustrated Booklet.

Pitcairn Field Willow Grove, Pa.

AIRCRAFT SERVICE DIRECTORY

See our Advertisement
On the inside back cover of May 3rd issue
PIONEER INSTRUMENT COMPANY
254 LEXINGTON AVE. BROOKLYN NEW YORK

HASKELITE
PLYWOOD
Used by every important builder. Recognized as the standard plywood for airplane construction. Over 80 applications. Blue print data book on request.
HASKELITE MFG. CORPORATION
120 S LaSalle Street Chicago, Illinois

AIR CRAFT PARTS
Material specified by the government furnished quickly. Prices submitted on any quantity. Tell us your needs.
HUSBAND AIRCRAFT SPECIALTIES
1848 Carnegie Ave. Cleveland, Ohio

Piston Pins for Aircraft
Burgess Norton Precision Piston Pins for the following makes of motors are stocked by Automotive Jobbers everywhere.
Curtiss OX-5 · Curtiss OXX-6 · Wright Whirlwind J4 J5 · U.S.A Std Liberty
THE BURGESS NORTON MFG. CO.,
549 Peyton St., Geneva, Ill

TRIUMPH
MAGNETIC
FUEL GAGES FOR AIRCRAFT
NEW MODELS FOR COWL, WING OR SPECIAL TANKS
Manufactured by
The Boston Auto Gage Company
PITTSFIELD, MASSACHUSETTS

Distributors: Curtiss-Wright, Moth, Bellanca, Travel Air, Keystone-Loening, Irving Parachutes, Pioneer Instruments. Authorized Wright Dealer and Service Station.
AIRCRAFT CONSTRUCTION
LUDINGTON
Complete and modern Repair and Replacement Facilities. High class work, immediate attention in Metal, Wood, Covering, Painting and Welding.
Operators of the Phila. Airport
LUDINGTON PHILADELPHIA FLYING SERVICE, INC
City Office, 901 Atlantic Building, Philadelphia, Pa

PITCH & BANK INDICATOR
Your Position at a glance
Booklet "RIEKER Navigating Instruments" sent on request.
RIEKER INSTRUMENT COMPANY
1919 Fairmount Ave., Philadelphia Pa.

STEARMAN, KITTYHAWK and AEROMARINE KLEMM
GEO. A. WIES, INC
Hangar and Office Roosevelt Field · Garden City New York

AIA ASSOCIATES INC.
"A. A." SERVICE EQUIPMENT, SUPPLIES
"Everything on the Ground To Send Your Plane In The Air"
Send for New Catalog
535 5th Ave. — New York
Roosevelt Field — Long Island
Mu Aldgkiport, — Chicago

Nitrate Dopes
Crystal Clear Nitrate Dopes conform to U. S. Navy Specifications 49-D-4 and are unconditionally guaranteed.
55 gal. Drums—$1.20 gal.
35 gal. Drums—$1.25 gal.
5 gal. Cans — $1.50 gal.
Prices on special pigmented dopes on application.
Other brands as low as $1.00 per gal.
Write for literature.
JOHN S. COX AND SON
Aeronautical Supplies
Terre Haute Ind

AERIAL PHOTOS
A Job for Specialists
Aerial photography calls for highly specialized skill and equipment. We have both. Fairchild photo apparatus Sikorsky Planes trained men.
In 30 days we will start our annual photographic flight covering the following States: Conn., N. Y., N. J., Pa., Ohio, Mich., Ill., Ind. and Wis. If you or your customers have a subject to be photographed in these states, send for our special rates made possible by this co-operative flight.
New England Airways, Inc.
23 Church St., New Haven, Conn.

Phenix Clear Nitrate Dope
$1.80 per gal. in 50 Gal. Wood Barrels
$1.25 per gal. in 30 Gal. Wood Barrels
$1.35 per gal. in 5 Gal. Boxed Cans.
Immediate shipments F. O. B. factory. All fresh made from new and high grade materials.
PHENIX AIRCRAFT PRODUCTS CO.
Williamsville, N. Y

Don't Throw Spark Plugs Away
We can recondition your old Mica plugs to give the same service as new ones. Will stand 250 lbs. pressure test. 25c. each. Lots of 100 or more 18c. each. Reconditioned C.G. IXA Sparkplugs 15c. each.
SPARKPLUG RENEWAL SERVICE
P. O. Box 22, East Columbus, Ohio.

HANGARS
All-steel, fireproof. See models at our Jamaica Sea Airport.
Let us quote. Send for folder

ADVANCED AIRCRAFT CORPORATION
135-08 Jerome Ave., Richmond Hill, N. Y.

DANIEL GUGGENHEIM SCHOOL OF AERONAUTICS
Graduate and Undergraduate Courses in Aeronautical Engineering and Air Transport. Particulars from Dean, College of Engineering
NEW YORK UNIVERSITY
University Heights, New York, N. Y.

Northeaster
FLYING TOGS
HELMETS · GOGGLES
FLYING SUITS
WRITE FOR COMPLETE CATALOG

Quality Aircraft Tubing
TUBING
by
SUMMERILL
Manufacturers of Seamless Steel Tubing
Since 1899
Summerill Tubing Co.
Bridgeport Penna.

"Where To Buy It"
USE THIS HANDY BUYERS GUIDE WHEN YOU ARE IN NEED OF AVIATION MATERIAL OR SERVICES. IF YOU DO NOT FIND WHAT YOU WANT ADVERTISED HERE—
WRITE TO
Searchlight Dept.
Tenth Ave at 36th St., New York City

Professional Services

WINDTUNNEL
Aerodynamical Research. Complete Equipment.
Scientific Flying Model Tests.
Tunnel, Flying and Demonstration Models Made
Lowest Rates
For further information write
AERONAUTICAL RESEARCH LABORATORY
1128 Farm Road, Secaucus, N. J

Youngberg, Brown & Youngberg
Airport Engineers
620 No. Michigan Ave., Chicago, Ill.

Complete Airport Construction Service
Surveys, Designs, Construction
Write or Wire
B AND B CONSTRUCTION CO
1800 Lincoln Road, Columbus, Ohio

SEARCHLIGHT SECTION

EMPLOYMENT and BUSINESS OPPORTUNITIES—USED and SURPLUS NEW EQUIPMENT

UNDISPLAYED—RATE PER WORD
Positions Wanted, Positions Vacant, and all other classifications, excepting equipment, 10 cents a word, minimum $2.50 an insertion. 15 cents a word if a box number address care of any of our offices is used.
Proposals, 40 cents a line an insertion

INFORMATION
Box Numbers may be in care of our New York, Chicago or San Francisco offices.
Discount of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH
1 to 3 inches .... $6.00 an inch
4 to 7 inches .... 5.75 an inch
8 to 14 inches .... 5.50 an inch
Other spaces and contract rates on request.
An advertising inch is measured vertically on one column, 3 columns—30 inches—to a page.

FOR SALE

BARGAIN. OX-5 Travelair like new ship always in hangar. Miller action scintilla mag. Must sacrifice. W. H. Conner, Newark Air Service, Newark, N. J.

BARGAIN. Huff Daland Duster minus Hisso motor. Ship eligible for license equipped 80 gallon wing tanks fine for photography passenger service, $300. Want Waco parts—Cowling, lower wings, etc. R. W. Ruppert, 133 Union Place, North Bergen, N. J.

BRAND new arrow sport LeBlond "60" perfect condition just as it was received from the factory, never used, will sell at great sacrifice for quick sale. Telephone Freeport, Long Island, N. Y. 4853. Noah Rockwell.

BOOSTER magnetos—Brand new Robert Bosch Booster magneto only $17.50 each. U. S. Magneto Company, 808 Washington Blvd., Chicago, Ill.

BRAND new Curtiss OXX-6 motors for sale at bargain prices. Government rebuilt OX-5 motors and also new spare parts. Motors shipped with privilege of inspection. Aero Motor Sales Co., 500 East Jefferson Ave., Detroit, Mich.

FOR SALE: Lincoln Page 3 place OX-5 only 30 hours. Dual controls. Eligible for license. Bargain for student looking for solo hours. $1,280. Now near New York City. FS-512, Aviation, Tenth Ave. at 36th St., New York.

AMERICAN Eagle 3 place biplane, Kinner motor 447, bought last August, ninety hours, excellent condition, fully equipped, dual controls. Ideal for school ship or passenger service. May be seen at Rochester, N. Y. Municipal Airport. Forced sale, $1,985. W. B. Eddy, Rochester, N. Y.

FOR SALE: One OXX-6 super Swallow biplane in good condition. One thousand dollars, with free flying instructions to purchaser. L. B. Keith, Hays, Kansas.

Hisso Silichrome Valves
Standard size, oversize items or oversize heads, all parts for Hissos. Also lots of parts for Anzani motors. All kinds of complete motors from 28 to 400 hp., both air-cooled and water cooled. Write for quotations on your requirements.
KARL ORT, YORK, PA.

CENTER section Eaglerock N. C. licensed, March 1, 1930 with OX-5 motor turning 1,400 on ground. Center section Eaglerock less three wings with a Hisso motor. Lots of OX-5 motor parts and Berling magneto parts. Everything A-1 condition. Write for price. Arkoma Airways Inc., Okmulgee, Oklahoma.

DUE to a surplus of airplanes, we are sacrificing at unheard of prices several new productive licensed ships. No trades can be considered since prices have been cut from 20% to 30% below the actual value. Monocoupe, Velie motor overhauled fifteen hours ago. Ship like new. Never cracked. $1,400. American Eagle 1928 long nosed OX-5 job. New covering and special paint. Motor turns 1,425 on ground. $1,500. Eaglerock 1928 OX-5 good condition motor just overhauled and ship licensed until November 1930. $1,000. Several other licensed planes including Swallows, Cessnas, Ryan, Eagles and Great Lakes with prices ranging from $1,400 to $4,000. Beacon Airways of America, Inc., Richards Field, U. S. Highway 50, Kansas City, Mo.

FOR SALE—One 60 hp. LeBlond engine, five Velie M-5 engines. Very low price for quick sale. Also one airplane with 60 hp. Velie motor. Golden Eagle Aircraft Inc., Port Columbus, Columbus, Ohio.

An Exceptional Opportunity
to purchase at a greatly reduced price a privately owned
TRAVEL-AIR J6 165

This ship, purchased new in December, has been flown less than one hundred hours from a private field and has had the finest possible mechanical attention. In addition to the standard instruments the following, all Pioneer, have been added:

Air Speed Indicator; Bank and Turn Indicator; Compass; Fuel Level Gauge, and Rate of Climb Indicator.

This ship is also equipped with dual controls, Eclipse starter, Bendix brakes, Ace fire extinguisher under pressure to the motor, 30x5 tires, adjustable pilot seat, steel propeller, navigation and instrument lights and special color.

As it stands this ship represents an investment of over $7,000, but because the owner is purchasing a larger job, he is offering it at considerable sacrifice. Price $5,000.

FS-526, Aviation, Tenth Ave. at 36th St., New York City

FAIRCHILD 71
Seven place Wasp ship fine condition, motor recently overhauled at P. & W. Service Station. Priced for quick sale at $8,650. Wire or write
W. H. MILLHAEM
Municipal Airport, Des Moines

Used Plane Values offered by
EMBRY-RIDDLE
Waco 10's, OX5 Motors $1300 and up
Waco, 9, Hisso Motor $1800
Monocoupe, like new $1850
Write for complete bargain list
EMBRY-RIDDLE COMPANY
Lunken Airport
Cincinnati, Ohio

FOR SALE

FOR SALE The best buys in the United States three licensed OX-5 Wacos 10's all have baggage compartments and compasses, one of them Scwo but 30 hours priced from $1400 to One OX-5 Travel Air 4 months old, cannot be told from new has Scintilla magneto These ships are in excellent condition and must be seen to be appreciated priced to sell Free flying instructions on any of these ships if necessary Becker & Farmer Flying Service, Jackson Mich

FOR SALE—J-5 Eaglerock, A-1 condition, special gauge, etc. located New York State attractively priced for cash will consider small Kinner job. FS-611 Aviation Tenth Ave at 36th St New York

FOR SALE: OX 5 OXX-6 and Hisso engines. Write for complete description Heineman Machine Works, 4926 Lake Street, Chicago Illinois

FOR SALE Two Eclipse electric inertia starters for Wright Whirlwind engines. Also two hand inertia starters for Wright engines $100 each. Becker-Farmer Flying Service Jackson, Mich.

FOR SALE Eagle Rock Blues A biplane six months old Used 85 hours Like new Perfect condition Price $1,585 Write or wire C M Onsted 1508 Arcade Bldg St Louis Mo

FOR SALE—Licensed OX-5 Waco 10 first class condition $1450 Tex LaGrone, 456 Knickerbocker Place, Kansas City, Mo.

SACRIFICE SALE

The following equipment must be sold at once:

2—Hisso Eaglerocks nearly new

2—DeHavilland Gipsy Moths, one with very little time

All ships licensed and guaranteed.

E. S. BRAMLEY Rensselaer, N. Y.

FOR SALE PARTS FOR HISPANO-SUIZA MOTORS

Model A or I Pistons Assemblies—$8.00 each

Model A Inner and Outer Connecting Rods—$18.00 pr

Model E or I Crankcases—$175.00 each

Model E Crankshafts—$75.00 each

Dixie 800 Magnetos—$22.50 each

OX5 and Hisso Carburetor Parts.

Above items brand new and offered subject to prior sale.

SOUTHLAND JOBBING HOUSE Norfolk Virginia

FOR SALE "B" WASPS

(Perfect condition)

$2000 — $2500

233B—$2000 227B—$2500

234B—$2000 943B—$2500

882B—$2500

Above motors have had from 600 to 800 hours, have been overhauled every 175 hours and are now thoroughly reconditioned and worn parts replaced Price includes Generator Control Box, 0 Valves and Starter, as is.

Hamilton Wasp Propellers at equally low figures.

Pacific Air Transport (Boeing System) Oakland Airport, Oakland, California

FOR SALE

FOR SALE Fairchild five place cabin monoplane Powered with a Wasp 420 hp motor Licensed This is a perfect ship in every way and will have to be flown to be appreciated Original cost $18,000 Will now sell at $7,000 Northern Aircraft Corp., 330 Stearns Bldg, Bay City Michigan

FOR SALE J-5 taper wing Waco 180 hours $4,000 equipped with air wheels OX-5 Bird 125 hours $1,400 Miller overhead and air wheels Stinson Jr., Warner motor 400 hours, newly recovered $4,800 Write or Wire Interstate Sales Corporation Hudson Ohio

FOR SALE Completely overhauled J-4 B motors. Block tested and ready to run Excellent condition Also new and used [illegible] Reynolds Aviation of N C [illegible] Salem N C

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We will provide for immediate sale FC 2 Fairchild with J-5 AB Wright Whirlwind motor Ship has had 413 hours service but motor has had complete overhaul at Wright service also and in excellent shape. Ship is completely equipped.

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STURDY for hard knocks and strains of training use—light and easily maneuverable for the sport uses of flying clubs—these are the twin possessions of the D. H. Moth that make it America's most popular light plane.

Flying school operators unstintingly praise the Moth, and their words have the weight of experience. Notable among these messages of approbation is that recently received from Reginald I. Heath, General Manager of Utica Flying Service, Inc., of Utica, N. Y.

"During the late fall and winter months, when flying conditions here are at their worst, we trained many students for private pilot's license. Their average dual time was 9½ hours. The students' proficiency in all stages of training was excellent and their confidence in the Moth universal. From a commercial operator's point of view, having soloed quite a number of students in various types of planes, I know that the anxiety that often prevails while watching a student solo is practically eliminated when the Moth is used.

"The Moth stands up well in training. Owing to its excellent stability, slow landing speed and rugged undercarriage, we have put in 230 hours of student work with our Moth and have not replaced a single part.

"It is interesting to note that during the first week of January, after eighteen inches of snow had fallen and our field was passed up by the mail pilot, the Moth was taken out and flown with wheel landing gear. It took off and landed without any trouble."

The sturdiness of the Moth and its reserve of power would do credit to a much heavier and more expensive ship. Yet its trimness and easy maneuverability are such that it has become a favorite with flying clubs throughout the world. A large portion of the membership of these clubs is made up of newly licensed pilots who find the stability and sportiness of the Moth precisely to their liking.

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Price $3,960 Wing Slots $240 Additional

For details of club ownership plan and complete information on the Moth, address Dept. M 73

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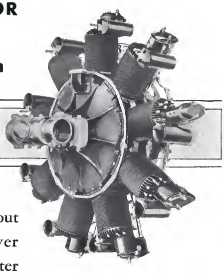

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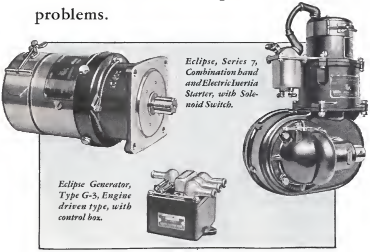

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